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(71) 出願人 000006013

三菱電機株式会社

東京都千代田区丸の内二丁目2番3号

(72) 発明者 片山 敏二

東京都千代田区丸の内二丁目2番3号 三

菱電機株式会社内

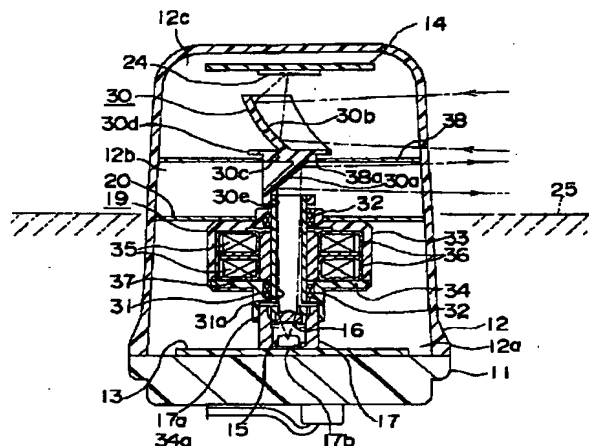
(74) 代理人 弁理士 曾我 道照 (外6名)

(54) 【発明の名称】 車両用光レーダ装置

(57) 【要約】

【課題】 この発明は、組立性の向上が図られ、車載時のデザイン上の制約を解消でき、十分な距離測定性能が得られる車両用光レーダ装置を得ることを目的とする。

【解決手段】 発光素子15がパルスモータ19の中空軸31の一端側に配置されている。そして、送光ミラー30aおよび受光ミラー30bを一体に成形されたミラー組立体30が中空軸31の他端に固着されている。さらに受光素子24が反射ミラー30bの集光位置に配設されている。発光素子15から出射された送光ビームは、送光レンズ16および中空軸31の中空部31aを通して送光ミラー30aに導かれケース12外に送光される。対象物で反射された送光ビームは受光ミラー30bで反射集光され、受光素子24に受光される。



- | | | |
|-------------------|---------------|----------------|
| 15:発光素子(発光源) | 30:ミラー組立体 | 33:ハウジング(保持部材) |
| 16:送光レンズ(発光源) | 30a:送光ミラー | 34:カバー(保持部材) |
| 17:ホルダ(発光源) | 30b:受光ミラー | 34a:嵌合部(被嵌合部) |
| 17a:嵌合部(嵌合部) | 30c:胴部(中間部) | 38:遮光板 |
| 19:パルスモータ(77フェイタ) | 30d:金突部 | 38a:貫通孔 |
| 24:受光素子 | 31:中空軸(回転駆動軸) | |
| | 31a:中空部 | |

【特許請求の範囲】

【請求項1】 送光ビームを出射する発光源と、対象物によって反射される前記送光ビームの反射光を受光する受光素子と、前記送光ビームを反射して前記対象物に照射する送光ミラーと、前記対象物からの前記送光ビームの反射光を反射して前記受光素子に集光させる受光ミラーと、前記送光ミラーおよび前記受光ミラーを同期して回転駆動させるアクチュエータとを有し、前記発光源の送光信号と前記受光素子の受光信号とから前記対象物までの距離を検出する車両用光レーダ装置において、前記発光源が前記アクチュエータの回転駆動軸の一端面側に配置され、前記受光素子が前記アクチュエータの回転駆動軸の他端面側に配置され、かつ、前記送光ミラーおよび前記受光ミラーが前記アクチュエータの回転駆動軸の同一端面側に配置されていることを特徴とする車両用光レーダ装置。

【請求項2】 送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の他端面側に配置され、かつ、前記アクチュエータの回転駆動軸が円筒状の中空軸で構成され、発光源から出射された送光ビームを前記中空軸の中空部を通して前記送光ミラーに導くようにしたことを特徴とする請求項1記載の車両用光レーダ装置。

【請求項3】 導光体が中空軸の中空部に配設され、かつ、その端面が凸面に形成され、発光源から出射された送光ビームを前記導光体を通して所定の広がり角に調整して送光ミラーに導くようにしたことを特徴とする請求項2記載の車両用光レーダ装置。

【請求項4】 送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の一端面側に配置され、前記アクチュエータの回転駆動軸が円筒状の中空軸で構成され、かつ、導光体が前記中空軸の中空部に配設され、対象物からの送光ビームの反射光を前記導光体を通して受光素子に導くようにしたことを特徴とする請求項1記載の車両用光レーダ装置。

【請求項5】 送光ビームを出射する発光源と、対象物によって反射される前記送光ビームの反射光を受光する受光素子と、前記送光ビームを反射して前記対象物に照射する送光ミラーと、前記対象物からの前記送光ビームの反射光を反射して前記受光素子に集光させる受光ミラーと、前記送光ミラーおよび前記受光ミラーを同期して回転駆動させる円筒状の中空軸と、アクチュエータと、前記アクチュエータの回転トルクを前記中空軸に伝達する動力伝達手段とを有し、前記発光源の送光信号と前記受光素子の受光信号とから前記対象物までの距離を検出する車両用光レーダ装置において、前記発光源が前記中空軸の一端面側に配置され、前記受光素子が前記中空軸の他端面側に配置され、かつ、前記送光ミラーおよび前記受光ミラーが前記中空軸の同一端面側に配置されていることを特徴とする車両用光レーダ装置。

【請求項6】 送光ミラーおよび受光ミラーが中空軸の他端面側に配置され、発光源から出射された送光ビームを前記中空軸の中空部を通して前記送光ミラーに導くようにしたことを特徴とする請求項5記載の車両用光レーダ装置。

【請求項7】 導光体が中空軸の中空部に配設され、かつ、その端面が凸面に形成され、発光源から出射された送光ビームを前記導光体を通して所定の広がり角に調整して送光ミラーに導くようにしたことを特徴とする請求項6記載の車両用光レーダ装置。

【請求項8】 送光ミラーおよび受光ミラーが中空軸の一端面側に配置され、かつ、導光体が前記中空軸の中空部に配設され、対象物からの送光ビームの反射光を前記導光体を通して受光素子に導くようにしたことを特徴とする請求項5記載の車両用光レーダ装置。

【請求項9】 発光源の構成部材に係合部を設け、かつ、中空軸の保持部材に被係合部を設け、前記係合部を前記被係合部に係合させて、前記発光源から出射される送光ビームの光軸と前記中空軸の軸心とを一致させるようにしたことを特徴とする請求項2又は請求項6記載の車両用光レーダ装置。

【請求項10】 送光ミラーと受光ミラーとが一体に形成されていることを特徴とする請求項1乃至請求項9のいずれかに記載の車両用光レーダ装置。

【請求項11】 送光ミラーと受光ミラーとの中間部が遊嵌されて該中間部で送光ミラー側と受光ミラー側とに区画する遮蔽板を設け、かつ、前記中間部周りで前記遮蔽板の厚み方向で該遮蔽板と重なり合う鏝部を前記中間部に設け、前記遮蔽板と前記鏝部とで前記送光ミラー側から前記受光ミラー側への光の漏れを防止するようにしたことを特徴とする請求項10記載の車両用光レーダ装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、発光源からビーム光を照射し、対象物からの反射光を受光して該対象物までの距離を検出する車両用光レーダ装置に関し、特に発光源からのビーム光を走査させて広い範囲で対象物を検出する車両用光レーダ装置に関するものである。

【0002】

【従来の技術】図5は例えば特開平3-175390号公報に記載された従来の車両用光レーダ装置を示す断面図である。図において、レーザダイオード1、フォトダイオード2、光アイソレータ3、凹面鏡4およびパルスモータ5がケース7内の仕切り板8、9、10により区画された各スペースにそれぞれ収容されている。そして、凹面鏡4は、レーザダイオード1が配置された位置を焦点位置とするように配置され、パルスモータ5の回転軸に装着されて、レーザダイオード1の光軸を中心軸として回転できるようになっている。また、光アイソレ

ータ3は、レーザダイオード1と凹面鏡4との間に、レーザダイオード1の光軸に対して所定の角度をもって斜めに配置され、レーザダイオード1からのビーム光を透過させて凹面鏡4に導き、かつ、凹面鏡4からの反射光を反射してフォトダイオード2に導くようになっている。さらに、防塵用ガラス板6が凹面鏡4の回転円周方向で該凹面鏡4を包囲するようにケース7に設けられている。なお、各仕切り板8、9、10には、対象物の検出動作が遂行できるように、ビーム光を通過させる貫通孔が設けられている。

【0003】つぎに、上記従来の車両用光レーダ装置の動作について説明する。レーザダイオード1から出射された送光ビームは、光アイソレータ3を透過し凹面鏡4に導かれる。そして、凹面鏡4に導かれた送光ビームは、パルスモータ5により回転されている凹面鏡4で反射され、ほぼ平行なビーム光となって、防塵用ガラス板6を透過してケース7外に照射される。このケース7外に照射された送光ビームは、凹面鏡4の回転円周方向に走査され、対象物があれば、該対象物で反射される。そして、対象物で反射された送光ビームの反射光は、防塵用ガラス板6を透過して凹面鏡4に至り、凹面鏡4でレーザダイオード1の方向に反射集光される。この凹面鏡4で反射集光された反射光は、光アイソレータ3で反射されてフォトダイオード2に導かれる。そして、演算処理手段(図示せず)により、レーザダイオード1の発光信号とフォトダイオード2の受光信号とに基づいて、対象物までの距離が演算される。さらに、対象物からの反射光をフォトダイオード2が受光した時のパルスモータ5の励磁相と基準位置との関係から、対象物の方向が検知される。

【0004】図6は従来の車両用光レーダ装置の他の例を示す断面図である。図において、ポリカーボネート樹脂、アクリル樹脂等の光透過材からなるケース12が内部を外部から隔離するようにカバー11に装着されている。そして、ホルダ20がケース12内を上下に区画するようにケース12内に配設されている。アクチュエータとしてのパルスモータ19はその回転軸19aを両側に延出するように構成され、該回転軸19aの両端がケース12内の区画された上下空間に延出するようにホルダ20に取り付けられている。また、電子回路が組み込まれた基板13、14がパルスモータ19を挟んでケース12内に配設されている。この基板13には、レーザダイオード等の発光素子15が実装されている。さらに、発光素子15から出射された送光ビームを所定の広がり角に調整する送光レンズ16がホルダ17に保持されて実装されている。そして、送光ミラー18がパルスモータ19の回転軸19aの一端側(基板13と相対する側)に、該回転軸19aの軸心に対して所定の角度をもって斜めに固着されている。この時、発光素子15の光軸と回転軸19aの軸心とは、互いに一致している。

一方、基板14には、受光光を電気信号に変換するフォトダイオード等の受光素子24が実装されている。また、パルスモータ19の回転軸19aの他端側(基板14と相対する側)には、ホルダ21が嵌着固定されている。このホルダ21には、対象物からの反射光を受光素子24に集光する受光レンズ22が取り付けられ、さらに受光レンズ22からの反射光の向きを変えて受光素子24に導く受光ミラー23が取り付けられている。なお、図中25は、このように構成された車両用光レーダ装置が装着された車両表面を示している。

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【0005】つぎに、上記従来の車両用光レーダ装置の動作について説明する。車両用レーダ装置が動作している時には、パルスモータ19が駆動されて、送光ミラー18と受光レンズ22とが同期して回転されている。発光素子15から出射された送光ビームは、送光レンズ16により所定の広がり角に調整されて送光ミラー18に導かれる。そして、送光ミラー18に導かれた送光ビームは、パルスモータ19により回転されている送光ミラー18で反射され、ケース12外に照射される。このケース12外に照射された送光ビームは、送光ミラー18の回転円周方向に走査され、対象物があれば、該対象物で反射される。そして、対象物で反射された送光ビームの反射光は、ケース12を透過して受光レンズ22に至り、受光レンズ22で集光される。そして、受光レンズ22で集光された反射光は、受光ミラー23で反射されて受光素子24に導かれる。そして、演算処理手段(図示せず)により、発光素子15の発光信号と受光素子24の受光信号とに基づいて、対象物までの距離が演算される。さらに、対象物からの反射光を受光素子24が受光した時のパルスモータ19の励磁相と基準位置との関係から、対象物の方向が検知される。この時、送受光のビーム光が車両と干渉しないようにする必要があり、車両用レーダ装置は車両表面25から飛び出して車両に装着されている。

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【0006】

【発明が解決しようとする課題】図5に示された従来の車両用光レーダ装置は以上のように、レーザダイオード1から出射された送光ビームおよび対象物からの送光ビームの反射光が、同一の光アイソレータ3、凹面鏡4および防塵用ガラス板6で透過あるいは反射されながら、外部に照射され、あるいはフォトダイオード2に受光されている。この送光ビームが外部に照射される過程において、送光ビームはその極一部が光アイソレータ3、凹面鏡4および防塵用ガラス板6で反射あるいは散乱される。そして、光アイソレータ3、凹面鏡4および防塵用ガラス板6で反射あるいは散乱されたこの僅かな送光ビームも、対象物からの反射光とともにフォトダイオード2に受光されてしまう。この僅かな送光ビームは、対象物からの反射光に対して大きな比率を占めることになり、S/N比が大幅に低下し、十分な距離測定性能が得

られなくなるという課題があった。一方、図 6 に示された従来の車両用光レーダ装置は以上のように、パルスモータ 19 の一端側に発光素子 15、送光レンズ 16 および送光ミラー 18 からなる送光光学系を配置し、他端側に受光レンズ 22、受光ミラー 23 および受光素子 24 からなる受光光学系を配置する構造を採っている。そこで、ケース 12 において、送光ビームの送光領域と反射光の受光領域とがパルスモータ 19 の回転軸 19a の軸心方向にパルスモータ 19 を挟んで位置しており、また装置を車両に搭載する際に、送受光のビーム光が車両と干渉しないようにする必要があることから、車両表面 25 からの装置の飛び出し量が大きくなり、デザイン上問題があるという課題があった。また、送光ミラー 18 および受光ミラー 23 がパルスモータ 19 の回転軸 19a の各端部に別々に組み込まれているので、送光ビームの送光方向と反射光の受光方向とを精度よく一致させるように送光ミラー 18 と受光ミラー 23 とを組み込むことが困難であり、さらには発光素子 15 および送光レンズ 16 を保持するホルダ 17 からなる発光源の構成部材による送光ビームの光軸と送光ミラー 18 を駆動する回転軸 19a の軸心とを一致させることが困難であり、部品の加工精度が高精度となるとともに、組立性が低下してしまうという課題もあった。なお、送光ビームの送光方向と反射光の受光方向とが大ききずれると、反射光の受光ができなくなり、また送光ビームの光軸と回転軸 19a の軸心とが一致していない場合には、送光ビームが回転円周方向に走査される際に、回転軸 19a の軸方向に変位しつつ走査されることになり、十分な距離測定性能が得られなくなる。

【0007】この発明は、上記のような課題を解決するためになされたもので、組立性の向上が図られ、車載時のデザイン上の制約が解消され、かつ、十分な距離測定性能が得られる車両用光レーダ装置を得ることを目的とする。

【0008】

【課題を解決するための手段】この第 1 の発明に係る車両用光レーダ装置は、送光ビームを出射する発光源と、対象物によって反射される送光ビームの反射光を受光する受光素子と、送光ビームを反射して対象物に照射する送光ミラーと、対象物からの送光ビームの反射光を反射して受光素子に集光させる受光ミラーと、送光ミラーおよび受光ミラーを同期して回転駆動させるアクチュエータとを有し、発光源の送光信号と受光素子の受光信号とから対象物までの距離を検出する車両用光レーダ装置において、発光源がアクチュエータの回転駆動軸の一端面側に配置され、受光素子がアクチュエータの回転駆動軸の他端面側に配置され、かつ、送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の同一端面側に配置されているものである。

【0009】また、この第 2 の発明に係る車両用光レー

ダ装置は、上記第 1 の発明において、送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の他端面側に配置され、かつ、アクチュエータの回転駆動軸が円筒状の中空軸で構成され、発光源から出射された送光ビームを中空軸の中空部を通して送光ミラーに導くようにしたものである。

【0010】また、この第 3 の発明に係る車両用光レーダ装置は、上記第 2 の発明において、導光体が中空軸の中空部に配設され、かつ、その端面が凸面に形成され、発光源から出射された送光ビームを導光体を通して所定の広がり角に調整して送光ミラーに導くようにしたものである。

【0011】また、この第 4 の発明に係る車両用光レーダ装置は、上記第 1 の発明において、送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の一端面側に配置され、アクチュエータの回転駆動軸が円筒状の中空軸で構成され、かつ、導光体が中空軸の中空部に配設され、対象物からの送光ビームの反射光を導光体を通して受光素子に導くようにしたものである。

【0012】また、この第 5 の発明に係る車両用光レーダ装置は、送光ビームを出射する発光源と、対象物によって反射される送光ビームの反射光を受光する受光素子と、送光ビームを反射して対象物に照射する送光ミラーと、対象物からの送光ビームの反射光を反射して受光素子に集光させる受光ミラーと、送光ミラーおよび受光ミラーを同期して回転駆動させる円筒状の中空軸と、アクチュエータと、アクチュエータの回転トルクを中空軸に伝達する動力伝達手段とを有し、発光源の送光信号と受光素子の受光信号とから対象物までの距離を検出する車両用光レーダ装置において、発光源が中空軸の一端面側に配置され、受光素子が中空軸の他端面側に配置され、かつ、送光ミラーおよび受光ミラーが中空軸の同一端面側に配置されているものである。

【0013】また、この第 6 の発明に係る車両用光レーダ装置は、上記第 5 の発明において、送光ミラーおよび受光ミラーが中空軸の他端面側に配置され、発光源から出射された送光ビームを中空軸の中空部を通して送光ミラーに導くようにしたものである。

【0014】また、この第 7 の発明に係る車両用光レーダ装置は、上記第 6 の発明において、導光体が中空軸の中空部に配設され、かつ、その端面が凸面に形成され、発光源から出射された送光ビームを導光体を通して所定の広がり角に調整して送光ミラーに導くようにしたものである。

【0015】また、この第 8 の発明に係る車両用光レーダ装置は、上記第 5 の発明において、送光ミラーおよび受光ミラーが中空軸の一端面側に配置され、かつ、導光体が中空軸の中空部に配設され、対象物からの送光ビームの反射光を導光体を通して受光素子に導くようにしたものである。

【0016】また、この第9の発明に係る車両用光レーダ装置は、上記第2又は第6の発明において、発光源の構成部材に係合部を設け、かつ、中空軸の保持部材に被係合部を設け、係合部を被係合部に係合させて、発光源から出射される送光ビームの光軸と中空軸の軸心とを一致させるようにしたものである。

【0017】また、この第10の発明に係る車両用光レーダ装置は、上記第1乃至第9の発明のいずれかの発明において、送光ミラーと受光ミラーとが一体に形成されているものである。

【0018】また、この第11の発明に係る車両用光レーダ装置は、上記第10発明において、送光ミラーと受光ミラーとの中間部が遊嵌されて該中間部で送光ミラー側と受光ミラー側とに区画する遮蔽板を設け、かつ、中間部周りで遮蔽板の厚み方向で該遮蔽板と重なり合う鍔部を中間部に設け、遮蔽板と鍔部とで送光ミラー側から受光ミラー側への光の漏れを防止するようにしたものである。

【0019】

【発明の実施の形態】以下、この発明の実施の形態を図について説明する。

実施の形態1. 図1はこの発明の実施の形態1に係る車両用光レーダ装置を示す断面図であり、図において図6に示した従来の車両用光レーダ装置と同一または相当部分には同一符号を付し、その説明を省略する。図において、ホルダ17は有底円筒状に形成され、その上部外周部が係合部としての嵌合部17aを構成し、底部に発光素子15を外径基準で位置決めする貫通孔17bが設けられている。このホルダ17は、基板13に実装された発光素子15を貫通孔17b内に挿入するようにして基板13に取り付けられる。そして、送光レンズ16がホルダ17内に内径基準に保持されている。ここで、発光源は、発光素子15、送光レンズ16およびホルダ17から構成され、発光素子15の光軸が、送光レンズ16の中心を通り、かつ、嵌合部17aの中心軸と一致するようになっている。また、アクチュエータとしてのパルスモータ19は、中空部31aを有する回転駆動軸としての中空軸31がベアリング32を介して保持部材としてのハウジング33およびカバー34に回転自在に装着され、永久磁石37が中空軸31の外周に固着され、さらにコイル35およびコイル35の磁極を構成するステータ36が永久磁石37の周りに配設されて構成されている。このカバー34には、ホルダ17の嵌合部17aに嵌合される被係合部としての筒状の嵌合部34aが中空軸31と同心状に形成されている。

【0020】また、ミラー組立体30は、送光ビームを所定の方向に反射する送光ミラー30a、対象物からの送光ビームの反射光を受光素子24に反射集光する受光ミラー30b、送光ミラー30aと受光ミラー30bとの中間部にこれらと一体に設けられた円形断面の胴部3

0cおよびこの胴部30cの受光ミラー30b側に胴部30cの全周にわたって径方向に延設された鍔部30dとから構成されている。また、送光ミラー30aには、ハウジング33から突出する中空軸31の先端に嵌合される嵌合穴30eが設けられている。なお、このミラー組立体30は例えば樹脂材を所望の形状に成形した後、所定の部位にアルミコーティング等の反射コーティングを施して送光ミラー30aおよび受光ミラー30bを構成している。ここで、送光ミラー30aは中空軸31の軸心に対して45°の角度をもつ平面鏡に形成され、受光ミラー30bは凹面鏡に形成されている。さらに、ベース20および遮蔽板38がケース12内に互いに平行に配設されて、ケース12内がパルスモータ19を収容する第1の空間12a、送光ミラー30aを収容する第2の空間12bおよび受光ミラー30bを収容する第3の空間12cに区画されている。

【0021】ここで、ミラー組立体30は、胴部30cが遮蔽板38の貫通孔38aに遊嵌され、送光ミラー30aが第2の空間12b内に位置し、かつ、受光ミラー30bが第3の空間12c内に位置するように、配置されている。そして、鍔部30dが胴部30cの外周部で遮蔽板38と中空軸31の軸心方向で互いに重なり合っている。さらに、第3の空間12c内には、基板14に実装された受光素子24が受光ミラー30cの焦点位置に配設されている。また、パルスモータ19が、ハウジング33をベース20の貫通孔に圧入されて、中空軸31が第2の空間12b内に突出するようにベース20に固着されている。そして、第2の空間12b内に突出する中空軸31の先端にミラー組立体30の嵌合穴30eが圧入され、ミラー組立体30が中空軸31に位置決めされて固着されている。さらに、カバー34に設けられた嵌合部34aがホルダ17の嵌合部17aに嵌め込まれ、中空軸31と基板13に実装された発光素子15との位置決めが行われている。

【0022】このように構成された車両用光レーダ装置は、発光素子15の光軸と中空軸31の軸心とが一致され、受光素子24が発光素子15の光軸の延長線上に配置され、送光ミラー30aと受光ミラー30bとがパルスモータ19の中空軸31により同期して回転駆動されるようになっている。そして、この車両用光レーダ装置は、第2および第3の空間12b、12cが車両表面25から飛び出すように車両に装着されている。

【0023】つぎに、この実施の形態1の動作について説明する。車両用レーダ装置が動作している時には、パルスモータ19が駆動され、中空軸31が回転される。そして、中空軸31に固着されているミラー組立体30が回転される。即ち、送光ミラー30aと受光ミラー30bとが同期して中空軸31の軸心を回転中心として回転される。発光素子15から出射された送光ビームは、送光レンズ16により所定の広がり角に調整され、中空

軸31の中空部31aを通して送光ミラー30aに導かれる。そして、送光ミラー30aに導かれた送光ビームは、送光ミラー30aで反射され、ケース12外に照射される。このケース12外に照射された送光ビームは、送光ミラー30aの回転円周方向に走査され、対象物があれば、該対象物で反射される。そして、対象物で反射された送光ビームの反射光は、ケース12を透過して第3の空間12c内の受光ミラー30bに至り、受光ミラー30bで反射集光されて受光素子24に導かれる。そして、演算処理手段(図示せず)により、発光素子15の発光信号と受光素子24の受光信号とに基づいて、対象物までの距離が演算される。さらに、対象物からの反射光を受光素子24が受光した時のパルスモータ19の励磁相と基準位置との関係から、対象物の方向が検知される。

【0024】このように、この実施の形態1によれば、発光素子15、送光レンズ16およびホルダ17からなる発光源がパルスモータ19の中空軸31の一端面側に配置され、受光素子24が中空軸31の他端面側に配置され、かつ、送光ミラー30aおよび受光ミラー30bが中空軸31の他端面側に配置されている。そこで、車両用光レーダ装置は、中空軸31の他端面側のみを車両表面25から飛び出して車両に搭載すればよく、車両表面25からの飛び出し量を小さくすることができ、車載時のデザイン上の制約を解消することができる。また、送光ミラー30aと受光ミラー30bとをミラー組立体30として一体に成形しているため、送光ビームの走査領域と対象物からの反射光の受光領域とを中空軸31の軸心方向、即ち車両表面25からの飛び出し方向で近接させることができ、その分車両表面25からの装置の飛び出し量を小さくすることができる。また、送光ミラー30aと受光ミラー30bとの相対位置が高精度に確保でき、送光ビームの送光方向と反射光の受光方向とが高精度に一致され、精度よく距離測定を行うことができる。また、ミラー組立体30を中空軸31の先端に固着するだけで、送光ミラー30aと受光ミラー30bとを同期して回転駆動できるようになり、組立性を向上させることができる。

【0025】また、中空軸31の中空部31aを通して発光素子15から出射された送光ビームを送光ミラー30aに導くようにしているので、発光素子15から送光ミラー30aへの送光ビームの伝達系に特別な光学系を用いる必要がなく、構成の簡素化が図られ、組立性の向上および低コスト化が達成される。また、中空軸31を支持するカバー34に設けられた嵌合部34aと、ホルダ17に設けられた嵌合部17aとを嵌合させて、ミラー組立体30の送光ミラー30aの回転軸心である中空軸31の軸心と発光素子15の光軸とを一致させているので、送光ビームを中空軸31の軸心方向に変位することなく回転円周方向に走査することができる。また、遮

蔽板38がケース12内に第2の空間12bと第3の空間12cとに区画するように配設され、ミラー組立体30の胴部30cが遮蔽板38の貫通孔38aに遊嵌され、かつ、鏝部30dが中空軸31の軸心方向(遮蔽板38の厚み方向)で遮蔽板38と互いに重なり合うようになっている。そこで、第2の空間12b内で反射あるいは散乱された送光ビームが、遮蔽板38および鏝部30dにより第3の空間12c側に入射することが阻止され、受光素子24に受光されることが防止される。その結果、S/N比の低下が抑えられ、十分な距離測定性能が得られる。

【0026】実施の形態2. 図2はこの発明の実施の形態2に係る車両用光レーダ装置を示す断面図である。この実施の形態2におけるミラー組立体30では、ハウジング33から突出する中空軸31の先端に嵌合される嵌合穴30eが受光ミラー30bに設けられている。また、ベース20および遮蔽板38がケース12内に互いに平行に配設されて、ケース12内がパルスモータ19を収容する第1の空間12a、受光ミラー30bを収容する第3の空間12cおよび送光ミラー30aを収容する第2の空間12bに区画されている。また、パルスモータ19が、ハウジング33をベース20の貫通孔に圧入されて、中空軸31が第3の空間12c内に突出するようにベース20に固着されている。そして、第3の空間12c内に突出する中空軸31の先端にミラー組立体30の嵌合穴30eが圧入され、ミラー組立体30が中空軸31に位置決めされて固着されている。このミラー組立体30は、胴部30cが遮蔽板38の貫通孔38aに遊嵌され、送光ミラー30aが第2の空間12b内に位置し、かつ、受光ミラー30bが第3の空間12c内に位置するように、配置されている。そして、鏝部30dが胴部30cの外周部で遮蔽板38と中空軸31の軸心方向で互いに重なり合っている。

【0027】受光素子24は、カバー11に取り付けられた基板13上に、中空軸31の軸端に近接して、かつ、中空軸31の軸心位置に実装されている。また、発光素子15は、遮蔽板38で区画された第2の空間12b内に、光軸が中空軸31の軸心と一致するように基板14上に実装されている。さらに、送光レンズ16は、発光素子15の光軸が送光レンズ16の中心を通るようにホルダ17に取り付けられている。また、ポリカーボネート樹脂やガラス等の光透過材からなる導光体40が中空軸31の中空部31a内に充填されている。

【0028】つぎに、この実施の形態2の動作について説明する。車両用レーダ装置が動作している時には、パルスモータ19が駆動され、中空軸31が回転される。そして、中空軸31に固着されているミラー組立体30が回転される。即ち、送光ミラー30aと受光ミラー30bとが同期して中空軸31の軸心を回転中心として回転される。発光素子15から出射された送光ビームは、

送光レンズ 16 により所定の広がり角に調整され、送光ミラー 30a に導かれる。そして、送光ミラー 30a に導かれた送光ビームは、送光ミラー 30a で反射され、第 2 の空間 12b を通ってケース 12 外に照射される。このケース 12 外に照射された送光ビームは、送光ミラー 30a の回転円周方向に走査され、対象物があれば、該対象物で反射される。そして、対象物で反射された送光ビームの反射光は、ケース 12 を透過して第 3 の空間 12c 内の受光ミラー 30b に至り、受光ミラー 30b で反射集光されて、中空軸 31 の中空部 31a 内に配設された導光体 40 を通り、受光素子 24 に導かれる。そして、演算処理手段（図示せず）により、発光素子 15 の発光信号と受光素子 24 の受光信号とに基づいて、対象物までの距離が演算される。さらに、対象物からの反射光を受光素子 24 が受光した時のパルスモータ 19 の励磁相と基準位置との関係から、対象物の方向が検知される。

【0029】このように、この実施の形態 2 によれば、上記実施の形態 1 と同様の効果が得られるとともに、受光ミラー 30b で反射された対象物からの反射光が導光体 40 を介して効率よく受光素子 24 に受光され、距離測定性能を向上させることができる。

【0030】実施の形態 3。図 3 はこの発明の実施の形態 3 に係る車両用光レーダ装置を示す断面図である。図において、ガラス等の光透過材からなる導光体 50 が中空軸 31 の中空部 31a 内に充填され、該導光体 50 の先端面が凸面 50a に成形され、発光素子 15 が光軸を中空軸 31 の軸心と一致させ、かつ、導光体 50 の凸面 50a に近接して配置されている。なお、他の構成は、上記実施の形態 1 と同様に構成されている。この実施の形態 3 では、発光素子 15 から出射された送光ビームは、導光体 50 を通り所定の広がり角に調整されて送光ミラー 30a に導かれる。従って、この実施の形態 3 によれば、上記実施の形態 1 と同様の効果が得られる。さらに、導光体 50 の端面に凸面 50a を成形してレンズ効果を持たせているので、送光レンズ 16 や送光レンズ 16 の保持部材が不要となり、発光源の構成部品点数が削減され、その分組立性の向上および低コスト化を図ることができる。

【0031】実施の形態 4。図 4 はこの発明の実施の形態 4 に係る車両用光レーダ装置を示す断面図である。図において、パルスモータ 19 が第 1 の空間 12a 内に配設されている。そして、パルスモータ 19 のハウジング 33 には、被係合部としての嵌合部 33a が設けられ、この嵌合部 33a に発光源を構成部品であるホルダ 17 の嵌合部 17a が嵌合されている。また、円筒状の中空軸 51 がベアリング 52 を介してベース 20 およびハウジング 33 に回転自在に取り付けられている。この時、ハウジング 33 を介して発光源と中空軸 51 とが位置決めされ、中空軸 51 の軸心と発光素子 15 の光軸とが一

致するようになっている。さらに、ミラー組立体 30 の嵌合穴 30e がベース 20 から突出する中空軸 51 の先端に嵌合されて、ミラー組立体 30 が中空軸 51 に位置決めされて固着されている。中空軸 51 にはギア 53 が一体に成形され、このギア 53 がパルスモータ 19 の出力軸 54 の先端に固着されているピニオン 55 にかみあわされている。ここで、ギア 53 およびピニオン 55 が動力伝達手段を構成している。なお、他の構成は上記実施の形態 1 と同様に構成されている。

【0032】つぎに、この実施の形態 4 の動作について説明する。車両用レーダ装置が動作している時には、パルスモータ 19 が駆動され、パルスモータ 19 の回転トルクが出力軸 54、ピニオン 55 およびギア 53 を介して中空軸 51 に伝達され、中空軸 51 が回転される。そして、中空軸 51 に固着されているミラー組立体 30 が回転される。即ち、送光ミラー 30a と受光ミラー 30b とが同期して中空軸 51 の軸心を回転中心として回転される。そこで、発光素子 15 から出射された送光ビームは、送光レンズ 16 により所定の広がり角に調整され、中空軸 51 の中空部 51a を通って送光ミラー 30a に導かれる。そして、送光ミラー 30a に導かれた送光ビームは、送光ミラー 30a で反射され、第 2 の空間 12b を通ってケース 12 外に照射される。このケース 12 外に照射された送光ビームは、送光ミラー 30a の回転円周方向に走査され、対象物があれば、該対象物で反射される。そして、対象物で反射された送光ビームの反射光は、ケース 12 を透過して第 3 の空間 12c 内の受光ミラー 30b に至り、受光ミラー 30b で反射集光されて受光素子 24 に導かれる。そして、演算処理手段（図示せず）により、発光素子 15 の発光信号と受光素子 24 の受光信号とに基づいて、対象物までの距離が演算される。さらに、対象物からの反射光を受光素子 24 が受光した時のパルスモータ 19 の励磁相と基準位置との関係から、対象物の方向が検知される。

【0033】このように、この実施の形態 4 によれば、駆動源であるパルスモータ 19 をミラー組立体 30 を回転駆動する中空軸 51 と別体で構成しているため、上記実施の形態 1 に比べて、第 1 の空間 12a の容積が大きくなってしまふ点を除いて、上記実施の形態 1 と同様の効果が得られる。

【0034】なお、上記実施の形態 4 では、上記実施の形態 1 の車両用光レーダ装置において、駆動源であるパルスモータ 19 をミラー組立体 30 を回転駆動する中空軸 51 と別体で構成するものとしているが、実施の形態 1 に限らず、他の実施の形態に適用してもよい。また、上記各実施の形態では、ケース 12 として光透過材で構成するものとしているが、ケース 12 として可視光カット材を用いれば、距離測定時における可視光による外乱を抑えることができ、測定精度を高めることができる。さらに、発光素子 15 から出射される送光ビームを選択

的に透過させるレーザ光透過材を用いれば、測定時における外乱を確実に抑えることができ、測定精度を一層高めることができる。また、上記各実施の形態では、所望の形状に成形された樹脂成型品に反射コーティングを施して、送光ミラーおよび受光ミラーを一体に構成するものとしているが、所望の形状に成形された樹脂成型品に平板の反射鏡および凹面鏡を組みつけて送光ミラーおよび受光ミラーを一体に構成してもよい。あるいは、送光ミラーおよび受光ミラーを別体で成形した後、両者を固着してもよい。

【0035】

【発明の効果】この発明は、以上のように構成されているので、以下に記載されるような効果を奏する。

【0036】この第1の発明によれば、送光ビームを出射する発光源と、対象物によって反射される送光ビームの反射光を受光する受光素子と、送光ビームを反射して対象物に照射する送光ミラーと、対象物からの送光ビームの反射光を反射して受光素子に集光させる受光ミラーと、送光ミラーおよび受光ミラーを同期して回転駆動させるアクチュエータとを有し、発光源の送光信号と受光素子の受光信号とから対象物までの距離を検出する車両用光レーダ装置において、発光源がアクチュエータの回転駆動軸の一端面側に配置され、受光素子がアクチュエータの回転駆動軸の他端面側に配置され、かつ、送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の同一端面側に配置されているので、車載時の車両表面からの飛び出し量を小さくでき、デザイン上の制約を解消できる車両用光レーダ装置が得られる。

【0037】また、この第2の発明によれば、上記第1の発明において、送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の他端面側に配置され、かつ、アクチュエータの回転駆動軸が円筒状の中空軸で構成され、発光源から出射された送光ビームを中空軸の中空部を通して送光ミラーに導くようにしたので、光学系の構成が簡素化され、組立性の向上および低コスト化が図られる。

【0038】また、この第3の発明によれば、上記第2の発明において、導光体が中空軸の中空部に配設され、かつ、その端面が凸面に形成され、発光源から出射された送光ビームを導光体を通して所定の広がり角に調整して送光ミラーに導くようにしたので、発光源の構成部品点数が削減でき、その分組立性の向上および低コスト化が図られる。

【0039】また、この第4の発明によれば、上記第1の発明において、送光ミラーおよび受光ミラーがアクチュエータの回転駆動軸の一端面側に配置され、アクチュエータの回転駆動軸が円筒状の中空軸で構成され、かつ、導光体が中空軸の中空部に配設され、対象物からの送光ビームの反射光を導光体を通して受光素子に導くようにしたので、反射光が効率よく受光素子に受光され、

距離測定性能を向上させることができる。

【0040】また、この第5の発明によれば、送光ビームを出射する発光源と、対象物によって反射される送光ビームの反射光を受光する受光素子と、送光ビームを反射して対象物に照射する送光ミラーと、対象物からの送光ビームの反射光を反射して受光素子に集光させる受光ミラーと、送光ミラーおよび受光ミラーを同期して回転駆動させる円筒状の中空軸と、アクチュエータと、アクチュエータの回転トルクを中空軸に伝達する動力伝達手段とを有し、発光源の送光信号と受光素子の受光信号とから対象物までの距離を検出する車両用光レーダ装置において、発光源が中空軸の一端面側に配置され、受光素子が中空軸の他端面側に配置され、かつ、送光ミラーおよび受光ミラーが中空軸の同一端面側に配置されているので、車載時の車両表面からの飛び出し量を小さくでき、デザイン上の制約を解消できる車両用光レーダ装置が得られる。

【0041】また、この第6の発明によれば、上記第5の発明において、送光ミラーおよび受光ミラーが中空軸の他端面側に配置され、発光源から出射された送光ビームを中空軸の中空部を通して送光ミラーに導くようにしたので、光学系の構成が簡素化され、組立性の向上および低コスト化が図られる。

【0042】また、この第7の発明によれば、上記第6の発明において、導光体が中空軸の中空部に配設され、かつ、その端面が凸面に形成され、発光源から出射された送光ビームを導光体を通して所定の広がり角に調整して送光ミラーに導くようにしたので、発光源の構成部品点数が削減でき、その分組立性の向上および低コスト化が図られる。

【0043】また、この第8の発明によれば、上記第5の発明において、送光ミラーおよび受光ミラーが中空軸の一端面側に配置され、かつ、導光体が中空軸の中空部に配設され、対象物からの送光ビームの反射光を導光体を通して受光素子に導くようにしたので、反射光が効率よく受光素子に受光され、距離測定性能を向上させることができる。

【0044】また、この第9の発明によれば、上記第2又は第6の発明において、発光源の構成部材に係合部を設け、かつ、中空軸の保持部材に被係合部を設け、係合部を被係合部に係合させて、発光源から出射される送光ビームの光軸と中空軸の軸心とを一致させるようにしたので、組立性を向上させることができるとともに、送光ビームを中空軸の軸心方向に変位させることなく回転円周方向に走査でき、安定して距離測定を行うことができる。

【0045】また、この第10の発明によれば、上記第1乃至第9の発明のいずれかの発明において、送光ミラーと受光ミラーとが一体に成形されているので、組立性を向上させることができるとともに、送光ミラーと受光

ミラーとの相対的な位置関係が高精度に確保され、送光ビームの送光方向と反射光の受光方向とが高精度に一致でき、精度よく距離測定を行うことができる。また、送光ビームの走査領域を反射光の受光領域とを接近でき、その分車両表面からの飛び出し量を小さくすることができる。

【0046】また、この第11の発明によれば、上記第10発明において、送光ミラーと受光ミラーとの中間部が遊嵌されて該中間部で送光ミラー側と受光ミラー側とに区画する遮蔽板を設け、かつ、中間部周りで遮蔽板の厚み方向で該遮蔽板と重なり合う鍔部を中間部に設け、遮蔽板と鍔部とで送光ミラー側から受光ミラー側への光の漏れを防止するようにしたので、S/N比の低下が抑えられ、距離測定性能を向上させることができる。

【図面の簡単な説明】

【図1】 この発明の実施の形態1に係る車両用光レーダ装置を示す断面図である。

【図2】 この発明の実施の形態2に係る車両用光レーダ装置を示す断面図である。

【図3】 この発明の実施の形態3に係る車両用光レー

*ダ装置を示す断面図である。

【図4】 この発明の実施の形態4に係る車両用光レーダ装置を示す断面図である。

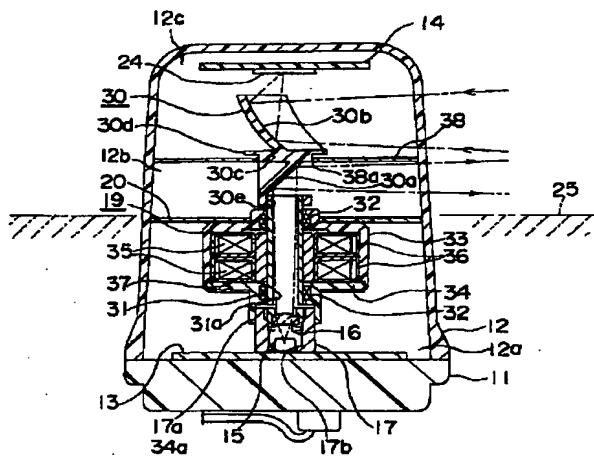
【図5】 従来の車両用光レーダ装置の一例を示す断面図である。

【図6】 従来の車両用光レーダ装置の他の例を示す断面図である。

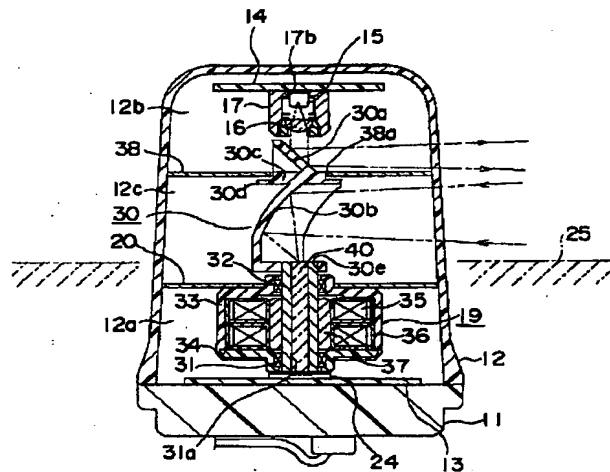
【符号の説明】

15 発光素子（発光源）、16 送光レンズ（発光源）、17 ホルダ（発光源）、17a 嵌合部（係合部）、19 パルスモータ（アクチュエータ）、24 受光素子、30 ミラー組立体、30a 送光ミラー、30b 受光ミラー、30c 胴部（中間部）、30d 鍔部、31 中空軸（回転駆動軸）、31a 中空部、33 ハウジング（保持部材）、33a 嵌合部（係合部）、34 カバー（保持部材）、34a 嵌合部（被係合部）、38 遮蔽板、38a 貫通孔、40、50 導光体、50a 凸面、51 中空軸、51a 中空部、53 ギア（動力伝達手段）、54 ピニオン（動力伝達手段）。

【図1】



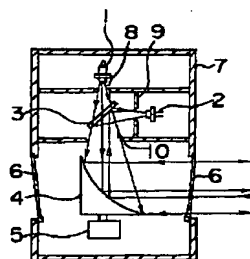
【図2】



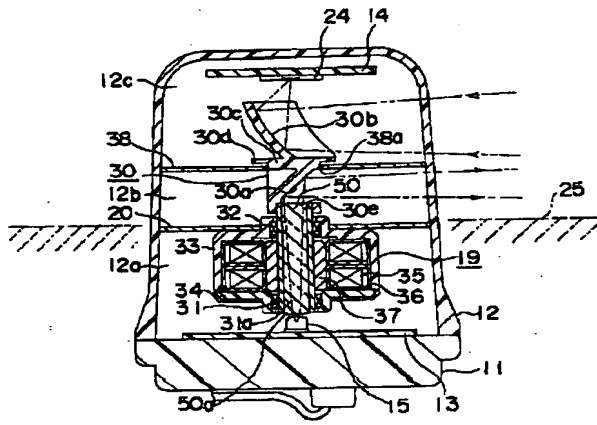
- | | | |
|--------------------|---------------|----------------|
| 15:発光素子(発光源) | 30:ミラー組立体 | 33:ハウジング(保持部材) |
| 16:送光レンズ(発光源) | 30a:送光ミラー | 34:カバー(保持部材) |
| 17:ホルダ(発光源) | 30b:受光ミラー | 34a:嵌合部(被係合部) |
| 17a:嵌合部(係合部) | 30c:胴部(中間部) | 38:遮蔽板 |
| 19:パルスモータ(アクチュエータ) | 30d:鍔部 | 38a:貫通孔 |
| 24:受光素子 | 31:中空軸(回転駆動軸) | |
| | 31a:中空部 | |

40:導光体

【図5】

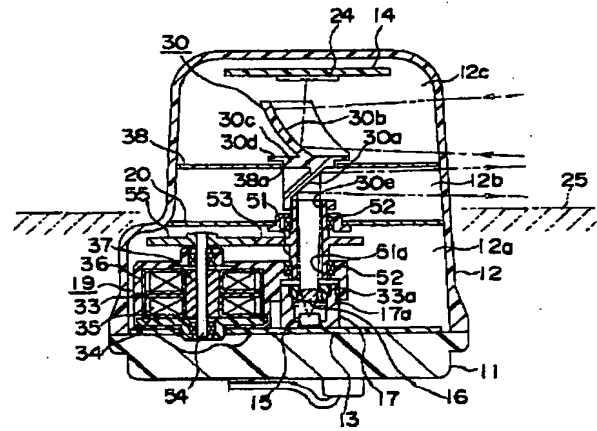


【図3】



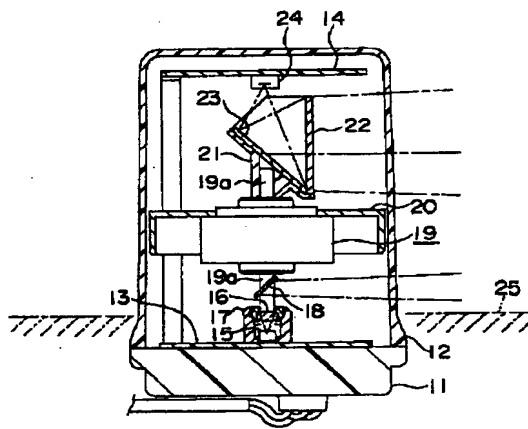
50:導光体
50a:凸面

【図4】



33a:嵌合部(横係合部)
51:中空軸
51a:中空部
53:ギア(動力伝達手段)
55:ピニオン(動力伝達手段)

【図6】



PATENT ABSTRACTS OF JAPAN

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(71)Applicant : MITSUBISHI ELECTRIC CORP

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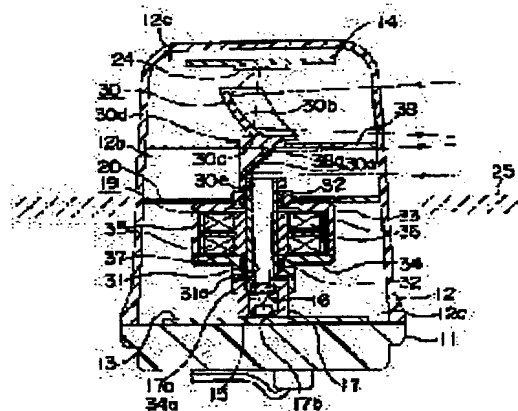
(72)Inventor : KATAYAMA KOJI

(54) OPTICAL RADAR FOR VEHICLE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a optical radar for vehicle with easier assembling operation and sufficient function for measuring distance but free from constraints of design for on-vehicle device.

SOLUTION: A luminous element 15 is arranged at one end of a hollow shaft 31 of a pulse motor 19. A mirror assembly 30 which is integrally formed of a light sending mirror 30a and a light receiving mirror 30b is attached at the other end of the hollow shaft 31. Furthermore, a photodetector 24 is located at the condensing position of the reflecting mirror 30b. Light sending beams emitted from the luminous element 15 is carried to the light sending mirror 30a via a light sending lens 16 and the hollow of the hollow shaft 31 and is finally led out of a case 12. The light sending beams reflected at an object are reflected and light-gathered by the light receiving mirror 30b and then received by the photodetector 24.



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CLAIMS

[Claim(s)]

[Claim 1] The source of luminescence which carries out outgoing radiation of the light transmission beam, and the photo detector which receives the reflected light of said light transmission beam reflected by the object, The light transmission mirror which reflects said light transmission beam and irradiates said object, and the light-receiving mirror which reflect the reflected light of said light transmission beam from said object, and said photo detector is made to condense, In the optical radar equipment for cars which has the actuator which it synchronizes [actuator] and carries out the rotation drive of said light transmission mirror and said light-receiving mirror, and detects the distance from the light transmission signal of said source of luminescence, and the light-receiving signal of said photo detector to said object Said source of luminescence is arranged at the end side side of the rotation driving shaft of said actuator. Optical radar equipment for cars characterized by arranging said photo detector at the other end side side of the rotation driving shaft of said actuator, and arranging said light transmission mirror and said light-receiving mirror at the same end-face side of the rotation driving shaft of said actuator.

[Claim 2] Optical radar equipment for cars according to claim 1 characterized by making it lead the light transmission beam by which the light transmission mirror and the light-receiving mirror have been arranged at the other end side side of the rotation driving shaft of an actuator, and the rotation driving shaft of said actuator consisted of cylinder-like hollow shafts, and outgoing radiation was carried out from the source of luminescence to said light transmission mirror through the centrum of said hollow shaft.

[Claim 3] Optical radar equipment for cars according to claim 2 characterized by a transparent material being arranged in the centrum of a hollow shaft, and the end face being formed in a convex, adjusting the light transmission beam by which outgoing radiation was carried out from the source of luminescence to a predetermined angle of divergence through said transparent material, and making it lead to a light transmission mirror.

[Claim 4] Optical radar equipment for cars according to claim 1 characterized by a light transmission mirror and a light-receiving mirror being arranged at the end side side of the rotation driving shaft of an actuator, and the rotation driving shaft of said actuator consisting of cylinder-like hollow shafts, and a transparent material being arranged in the centrum of said hollow shaft, and making it lead the reflected light of the light transmission beam from an object to a photo detector through said transparent material.

[Claim 5] The source of luminescence which carries out outgoing radiation of the light transmission beam, and the photo detector which receives the reflected light of said light transmission beam reflected by the object, The light transmission mirror which reflects said light transmission beam and irradiates said object, and the light-receiving mirror which reflect the reflected light of said light transmission beam from said object, and said photo detector is made to condense, The hollow shaft of the shape of a cylinder which it synchronizes [shape] and carries out the rotation drive of said light transmission mirror and said light-receiving mirror, In the optical radar equipment for cars which has an actuator and the power means of communication which transmits the running torque of said actuator to said hollow shaft, and detects the distance from the light transmission signal of said source of luminescence, and the light-receiving signal of said photo detector to said object Optical radar equipment for cars characterized by arranging said source of luminescence at the end side side of said hollow shaft, and arranging said photo detector at the other end side side of said hollow shaft, and arranging said light transmission mirror and said light-receiving mirror at the same end-face side of said hollow shaft.

[Claim 6] Optical radar equipment for cars according to claim 5 characterized by making it lead the light transmission beam to which the light transmission mirror and the light-receiving mirror have been arranged at the other end side side of a hollow shaft, and outgoing radiation was carried out from the source of luminescence to said light transmission mirror through the centrum of said hollow shaft.

[Claim 7] Optical radar equipment for cars according to claim 6 characterized by a transparent material being arranged in the centrum of a hollow shaft, and the end face being formed in a convex, adjusting the

light transmission beam by which outgoing radiation was carried out from the source of luminescence to a predetermined angle of divergence through said transparent material, and making it lead to a light transmission mirror.

[Claim 8] Optical radar equipment for cars according to claim 5 characterized by a light transmission mirror and a light-receiving mirror being arranged at the end side side of a hollow shaft, and a transparent material being arranged in the centrum of said hollow shaft, and making it lead the reflected light of the light transmission beam from an object to a photo detector through said transparent material.

[Claim 9] Optical radar equipment for cars according to claim 2 or 6 characterized by making it make in agreement the axial center of the optical axis and said hollow shaft of the light transmission beam by which prepare the engagement section in the configuration member of the source of luminescence, and prepare an engaged portion in the attachment component of a hollow shaft, said engagement section is made to engage with said engaged portion, and outgoing radiation is carried out from said source of luminescence.

[Claim 10] Optical radar equipment for cars according to claim 1 to 9 characterized by the light transmission mirror and the light-receiving mirror being fabricated by one.

[Claim 11] The shield which the pars intermedia of a light transmission mirror and a light-receiving mirror fits in loosely, and is divided to a light transmission mirror and light-receiving mirror side in this pars intermedia is formed. And optical radar equipment for cars according to claim 10 characterized by preparing the flange which overlaps this shield in the thickness direction of said shield by the circumference of said pars intermedia in said pars intermedia, and preventing the leakage of the light from said light transmission mirror side to said light-receiving mirror side by said shield and said flange.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention irradiates beam light from the source of luminescence, and relates to the optical radar equipment for cars which is made to scan the beam light from the source of luminescence, and detects an object in the large range especially about the optical radar equipment for cars which receives the reflected light from an object and detects the distance to this object.

[0002]

[Description of the Prior Art] Drawing 5 is the sectional view showing the conventional optical radar equipment for cars indicated by JP,3-175390,A. In drawing, it holds in each tooth space to which a laser diode 1, the photodiode 2, the optical isolator 3, the concave mirror 4, and the pulse motor 5 were divided by the diaphragms 8, 9, and 10 within a case 7, respectively. And a concave mirror 4 is arranged so that the location where the laser diode 1 has been arranged may be made into a focal location, the revolving shaft of a pulse motor 5 is equipped with it, and it can rotate now the optical axis of a laser diode 1 as a medial axis. Moreover, between a laser diode 1 and a concave mirror 4, an optical isolator 3 is aslant arranged with a predetermined include angle to the optical axis of a laser diode 1, makes the beam light from a laser diode 1 penetrate, and is led to a concave mirror 4, and reflects the reflected light from a concave mirror 4, and leads it to a photodiode 2. Furthermore, it is prepared in the case 7 so that the glass plate 6 for protection against dust may surround this concave mirror 4 by the rotation circumferential direction of a concave mirror 4. In addition, the through tube which passes beam light is prepared in each diaphragms 8, 9, and 10 so that detection actuation of an object can be carried out.

[0003] Below, actuation of the above-mentioned conventional optical radar equipment for cars is explained.

The light transmission beam by which outgoing radiation was carried out from the laser diode 1 penetrates an optical isolator 3, and is led to a concave mirror 4. And it is reflected with the concave mirror 4 which is rotating by the pulse motor 5, and the light transmission beam led to the concave mirror 4 serves as an almost parallel beam light, penetrates the glass plate 6 for protection against dust, and is irradiated out of a case 7. If the light transmission beam irradiated out of this case 7 is scanned by the rotation circumferencial direction of a concave mirror 4 and has an object, it will be reflected with this object. And the reflected light of the light transmission beam reflected with the object penetrates the glass plate 6 for protection against dust, and results in a concave mirror 4, and reflective condensing is carried out in the direction of a laser diode 1 with a concave mirror 4. It is reflected with an optical isolator 3 and the reflected light by which reflective condensing was carried out with this concave mirror 4 is led to a photodiode 2. And based on the flashing caution signal of a laser diode 1, and the light-receiving signal of a photodiode 2, the distance to an object calculates with a data-processing means (not shown). Furthermore, the direction of an object is detected from the relation between the excitation phase of the pulse motor 5 when a photodiode 2 receives the reflected light from an object, and a criteria location.

[0004] Drawing 6 is the sectional view showing other examples of the conventional optical radar equipment for cars. In drawing, covering 11 is equipped with the case 12 which consists of light transmission material, such as polycarbonate resin and acrylic resin, so that the interior may be isolated from the exterior. And it is arranged in the case 12 so that a holder 20 may divide the inside of a case 12 up and down. The pulse motor 19 as an actuator is constituted so that the revolving-shaft 19a may be extended on both sides, and it is attached in the holder 20 so that the both ends of this revolving-shaft 19a may extend to the vertical space where it was divided within the case 12. Moreover, the substrates 13 and 14 with which the electronic circuitry was incorporated are arranged in the case 12 on both sides of the pulse motor 19. The light emitting devices 15, such as a laser diode, are mounted in this substrate 13. Furthermore, the light transmission lens 16 which adjusts the light transmission beam by which outgoing radiation was carried out to a predetermined angle of divergence is held and mounted in the holder 17 from the light emitting device 15. And the light transmission mirror 18 has fixed aslant with the predetermined include angle to the axial center of this revolving-shaft 19a to the end side (side which faces a substrate 13) of revolving-shaft 19a of a pulse motor 19. At this time, the optical axis of a light emitting device 15 and the axial center of revolving-shaft 19a are mutually in agreement. On the other hand, the photo detectors 24, such as a photodiode which changes light-receiving light into an electrical signal, are mounted in the substrate 14. Moreover, attachment immobilization of the holder 21 is carried out at the other end side (side which faces a substrate 14) of revolving-shaft 19a of a pulse motor 19. The light-receiving lens 22 which condenses the reflected light from an object to a photo detector 24 is attached in this holder 21, and the light-receiving mirror 23 which changes the sense of the reflected light from the light-receiving lens 22 further, and is led to a photo detector 24 is attached in it. In addition, 25 in drawing shows the car front face where it was equipped with the optical radar equipment for cars constituted in this way.

[0005] Below, actuation of the above-mentioned conventional optical radar equipment for cars is explained. While the radar installation for cars is operating, a pulse motor 19 drives, and the light transmission mirror 18 and the light-receiving lens 22 are synchronizing and rotating. The light transmission beam by which outgoing radiation was carried out from the light emitting device 15 is adjusted to a predetermined angle of divergence by the light transmission lens 16, and is led to the light transmission mirror 18. And it is reflected by the light transmission mirror 18 currently rotated by the pulse motor 19, and the light transmission beam led to the light transmission mirror 18 is irradiated out of a case 12. If the light transmission beam irradiated out of this case 12 is scanned by the rotation circumferencial direction of the light transmission mirror 18 and has an object, it will be reflected with this object. And the reflected light of the light transmission beam reflected with the object penetrates a case 12, results in the light-receiving lens 22, and is condensed with the light-receiving lens 22. And it is reflected by the light-receiving mirror 23, and the reflected light condensed with the light-receiving lens 22 is led to a photo detector 24. And based on the flashing caution signal of a light emitting device 15, and the light-receiving signal of a photo detector 24, the distance to an object calculates with a data-processing means (not shown). Furthermore, the direction of an object is detected from the relation between the excitation phase of the pulse motor 19 when a photo detector 24 receives the reflected light from an object, and a criteria location. It is necessary to make it the beam light of transmission-and-reception light not interfere with a car, and at this time, the radar installation for cars jumps out of the car front face 25, and the car is equipped with it.

[0006]

[Problem(s) to be Solved by the Invention] As mentioned above, while the reflected light of the light transmission beam by which outgoing radiation was carried out from the laser diode 1, and the light

transmission beam from an object is penetrated or reflected with the same optical isolator 3, a concave mirror 4, and the glass plate 6 for protection against dust, the conventional optical radar equipment for cars shown in drawing 5 is irradiated outside, or is received by the photodiode 2. It sets in the process in which this light transmission beam is irradiated outside, and, as for a light transmission beam, those poles part are reflected or scattered about with an optical isolator 3, a concave mirror 4, and the glass plate 6 for protection against dust. And few of this light transmission beam reflected or scattered about with the optical isolator 3, the concave mirror 4, and the glass plate 6 for protection against dust will also be received by the photodiode 2 with the reflected light from an object. A big ratio will be occupied to the reflected light from an object, the S/N ratio fell sharply, and few of this light transmission beam had the technical problem that sufficient range measurement engine performance was no longer obtained. On the other hand, as mentioned above, the conventional optical radar equipment for cars shown in drawing 6 has arranged the light transmission optical system which is from a light emitting device 15, the light transmission lens 16, and the light transmission mirror 18 on the end side of a pulse motor 19, and has taken the structure which arranges the light-receiving optical system which is from the light-receiving lens 22, the light-receiving mirror 23, and a photo detector 24 on an other end side. Then, in the case 12, since it was necessary to make it the beam light of transmission-and-reception light not interfere with a car when the light transmission field of a light transmission beam and the light-receiving field of the reflected light are located in the direction of an axial center of revolving-shaft 19a of a pulse motor 19 on both sides of a pulse motor 19 and equipment is carried in a car, the amount of elutriation of the equipment from the car front face 25 became large, and the technical problem that there was a design top problem occurred. Moreover, since the light transmission mirror 18 and the light-receiving mirror 23 are separately included in each edge of revolving-shaft 19a of a pulse motor 19 It is difficult to incorporate the light transmission mirror 18 and the light-receiving mirror 23 so that the direction of light transmission of a light transmission beam and the light-receiving direction of the reflected light may be made in agreement with a sufficient precision. It is difficult to make in agreement the optical axis of the light transmission beam by the configuration member of the source of luminescence which consists of a holder 17 which furthermore holds a light emitting device 15 and the light transmission lens 16, and the axial center of revolving-shaft 19a which drives the light transmission mirror 18. While the process tolerance of components became highly precise, the technical problem that assembly nature will fall also occurred. In addition, if the direction of light transmission of a light transmission beam and the light-receiving direction of the reflected light shift greatly, when light-receiving of the reflected light becomes impossible and the optical axis of a light transmission beam and the axial center of revolving-shaft 19a are not in agreement, in case a light transmission beam is scanned by the rotation circumferencial direction, it will be scanned displacing to the shaft orientations of revolving-shaft 19a, and sufficient range measurement engine performance is no longer obtained.

[0007] It was made in order to solve the above technical problems, and improvement in assembly nature is achieved, and this invention aims at obtaining the optical radar equipment for cars with which the constraint on the design at the time of mount is canceled, and sufficient range measurement engine performance is obtained.

[0008]

[Means for Solving the Problem] The optical radar equipment for cars concerning this 1st invention The source of luminescence which carries out outgoing radiation of the light transmission beam, and the photo detector which receives the reflected light of the light transmission beam reflected by the object, The light transmission mirror which reflects a light transmission beam and irradiates an object, and the light-receiving mirror which reflect the reflected light of the light transmission beam from an object, and a photo detector is made to condense, In the optical radar equipment for cars which has the actuator which it synchronizes [actuator] and carries out the rotation drive of a light transmission mirror and the light-receiving mirror, and detects the distance from the light transmission signal of the source of luminescence, and the light-receiving signal of a photo detector to an object The source of luminescence is arranged at the end side side of the rotation driving shaft of an actuator, and a photo detector is arranged at the other end side side of the rotation driving shaft of an actuator, and the light transmission mirror and the light-receiving mirror are arranged at the same end-face side of the rotation driving shaft of an actuator.

[0009] Moreover, a light transmission mirror and a light-receiving mirror are arranged at the other end side side of the rotation driving shaft of an actuator, and the rotation driving shaft of an actuator consists of cylinder-like hollow shafts, and it is made for the optical radar equipment for cars concerning this 2nd invention to lead the light transmission beam by which outgoing radiation was carried out from the source of luminescence to a light transmission mirror through the centrum of a hollow shaft in the 1st above-

mentioned invention.

[0010] Moreover, a transparent material is arranged in the centrum of a hollow shaft, and the optical radar equipment for cars concerning this 3rd invention adjusts the light transmission beam by which that end face was formed in the convex and outgoing radiation was carried out from the source of luminescence to a predetermined angle of divergence through a transparent material, and it is made to lead it to a light transmission mirror in the 2nd above-mentioned invention.

[0011] Moreover, a light transmission mirror and a light-receiving mirror are arranged at the end side side of the rotation driving shaft of an actuator, and the rotation driving shaft of an actuator consists of cylinder-like hollow shafts, and a transparent material is arranged in the centrum of a hollow shaft, and it is made for the optical radar equipment for cars concerning this 4th invention to lead the reflected light of the light transmission beam from an object to a photo detector through a transparent material in the 1st above-mentioned invention.

[0012] Moreover, the optical radar equipment for cars concerning this 5th invention The source of luminescence which carries out outgoing radiation of the light transmission beam, and the photo detector which receives the reflected light of the light transmission beam reflected by the object, The light transmission mirror which reflects a light transmission beam and irradiates an object, and the light-receiving mirror which reflect the reflected light of the light transmission beam from an object, and a photo detector is made to condense, The hollow shaft of the shape of a cylinder which it synchronizes [shape] and carries out the rotation drive of a light transmission mirror and the light-receiving mirror, In the optical radar equipment for cars which has an actuator and the power means of communication which transmits the running torque of an actuator to a hollow shaft, and detects the distance from the light transmission signal of the source of luminescence, and the light-receiving signal of a photo detector to an object The source of luminescence is arranged at the end side side of a hollow shaft, and a photo detector is arranged at the other end side side of a hollow shaft, and the light transmission mirror and the light-receiving mirror are arranged at the same end-face side of a hollow shaft.

[0013] Moreover, a light transmission mirror and a light-receiving mirror are arranged at the other end side side of a hollow shaft, and it is made for the optical radar equipment for cars concerning this 6th invention to lead the light transmission beam by which outgoing radiation was carried out from the source of luminescence to a light transmission mirror through the centrum of a hollow shaft in the 5th above-mentioned invention.

[0014] Moreover, a transparent material is arranged in the centrum of a hollow shaft, and the optical radar equipment for cars concerning this 7th invention adjusts the light transmission beam by which that end face was formed in the convex and outgoing radiation was carried out from the source of luminescence to a predetermined angle of divergence through a transparent material, and it is made to lead it to a light transmission mirror in the 6th above-mentioned invention.

[0015] Moreover, a light transmission mirror and a light-receiving mirror are arranged at the end side side of a hollow shaft, and a transparent material is arranged in the centrum of a hollow shaft, and it is made for the optical radar equipment for cars concerning this 8th invention to lead the reflected light of the light transmission beam from an object to a photo detector through a transparent material in the 5th above-mentioned invention.

[0016] Moreover, the optical radar equipment for cars concerning this 9th invention prepares the engagement section in the configuration member of the source of luminescence, and prepares an engaged portion in the attachment component of a hollow shaft, makes the engagement section engage with an engaged portion, and it is made to make in agreement the axial center of the optical axis and hollow shaft of a light transmission beam by which outgoing radiation is carried out from the source of luminescence in the 2nd or 6th above-mentioned invention.

[0017] Moreover, in invention of the above 1st thru/or the 9th invention either, as for the optical radar equipment for cars concerning this 10th invention, the light transmission mirror and the light-receiving mirror are fabricated by one.

[0018] Moreover, the optical radar equipment for cars concerning this 11th invention The shield which the pars intermedia of a light transmission mirror and a light-receiving mirror fits in loosely, and is divided to a light transmission mirror and light-receiving mirror side in the 10th invention of the above in this pars intermedia is formed. And the flange which overlaps this shield in the thickness direction of a shield by the circumference of pars intermedia is prepared in pars intermedia, and the leakage of the light from a light transmission mirror side to a light-receiving mirror side is prevented by the shield and the flange.

[0019]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained about

drawing.

Gestalt 1. drawing 1 of operation is the sectional view showing the optical radar equipment for cars concerning the gestalt 1 of implementation of this invention, gives the same sign to the same as that of the conventional optical radar equipment for cars shown in drawing 6 in drawing, or a considerable part, and omits that explanation. In drawing, a holder 17 is fabricated in the shape of a closed-end cylinder, the up periphery section constitutes fitting section 17a as the engagement section, and through tube 17b which positions a light emitting device 15 on outer-diameter criteria at the pars basilaris ossis occipitalis is prepared. As this holder 17 inserts the light emitting device 15 mounted in the substrate 13 into through tube 17b, it is attached in a substrate 13. And the light transmission lens 16 is held in the holder 17 at bore criteria. Here, the source of luminescence consists of a light emitting device 15, a light transmission lens 16, and a holder 17, and its optical axis of a light emitting device 15 corresponds the core of the light transmission lens 16 with the medial axis of a passage and fitting section 17a. Moreover, housing 33 and covering 34 as an attachment component are equipped with the hollow shaft 31 as a rotation driving shaft which has centrum 31a free [rotation] through bearing 32, a permanent magnet 37 fixes on the periphery of a hollow shaft 31, the stator 36 which constitutes the magnetic pole of a coil 35 and a coil 35 further is arranged in the surroundings of a permanent magnet 37, and the pulse motor 19 as an actuator is constituted. Tubed fitting section 34a as an engaged portion by which fitting is carried out to fitting section 17a of a holder 17 is concentrically formed in this covering 34 with the hollow shaft 31.

[0020] Moreover, light transmission mirror 30a by which the mirror assembly 30 reflects a light transmission beam in the predetermined direction, Light-receiving mirror 30b which carries out reflective condensing of the reflected light of the light transmission beam from an object at a photo detector 24, It consists of 30d of flanges installed in the pars intermedia of light transmission mirror 30a and light-receiving mirror 30b in the direction of a path over the perimeter of drum section 30c at the light-receiving mirror 30b side of drum section 30c of the circular cross section established in these and one, and this drum section 30c. Moreover, fitting hole 30e by which fitting is carried out is prepared at the tip of the hollow shaft 31 which projects from housing 33 at light transmission mirror 30a. In addition, after this mirror assembly 30 fabricates for example, resin material in a desired configuration, it gives reflective coating, such as aluminum coating, to a predetermined part, and constitutes light transmission mirror 30a and light-receiving mirror 30b. Here, light transmission mirror 30a is formed in the plane mirror which has the include angle of 45 degrees to the axial center of a hollow shaft 31, and light-receiving mirror 30b is formed in the concave mirror. Furthermore, the base 20 and the shield 38 of each other are arranged in parallel in a case 12, and the inside of a case 12 is divided by 3rd space 12c which holds the 2nd space 12b and light-receiving mirror 30b which hold the 1st space 12a which holds a pulse motor 19, and light transmission mirror 30a.

[0021] Here, the mirror assembly 30 is arranged so that drum section 30c may fit loosely into through tube 38a of a shield 38, and light transmission mirror 30a may be located in 2nd space 12b and light-receiving mirror 30b may be located in 3rd space 12c. And 30d of flanges overlaps the shield 38 mutually in the direction of an axial center of a hollow shaft 31 in the periphery section of drum section 30c. Furthermore, in 3rd space 12c, the photo detector 24 mounted in the substrate 14 is arranged by the focal location of light-receiving mirror 30c. Moreover, the pulse motor 19 was pressed fit in the through tube of the base 20 in housing 33, and it has fixed at the base 20 so that a hollow shaft 31 may project in 2nd space 12b. And fitting hole 30e of the mirror assembly 30 was pressed fit at the tip of the hollow shaft 31 which projects in 2nd space 12b, and the mirror assembly 30 was positioned by the hollow shaft 31, and has fixed to it. Furthermore, fitting section 34a prepared in covering 34 is inserted in fitting section 17a of a holder 17, and positioning with a hollow shaft 31 and the light emitting device 15 mounted in the substrate 13 is performed.

[0022] Thus, the axial center of the optical axis and hollow shaft 31 of a light emitting device 15 is in agreement, a photo detector 24 is arranged on the production of the optical axis of a light emitting device 15, light transmission mirror 30a and light-receiving mirror 30b synchronize with the hollow shaft 31 of a pulse motor 19, and the rotation drive of the constituted optical radar equipment for cars is carried out. And the car is equipped with this optical radar equipment for cars so that the 2nd and 3rd space 12b and 12c may jump out of the car front face 25.

[0023] Below, actuation of the gestalt 1 of this operation is explained. While the radar installation for cars is operating, a pulse motor 19 drives and a hollow shaft 31 rotates. And the mirror assembly 30 which has fixed to the hollow shaft 31 rotates. That is, light transmission mirror 30a and light-receiving mirror 30b synchronize, and the axial center of a hollow shaft 31 is rotated as the center of rotation. The light transmission beam by which outgoing radiation was carried out from the light emitting device 15 is adjusted

to a predetermined angle of divergence by the light transmission lens 16, and is led to light transmission mirror 30a through centrum 31a of a hollow shaft 31. And it is reflected by light transmission mirror 30a, and the light transmission beam led to light transmission mirror 30a is irradiated out of a case 12. If the light transmission beam irradiated out of this case 12 is scanned by the rotation circumferential direction of light transmission mirror 30a and has an object, it will be reflected with this object. And a case 12 is penetrated, it results in light-receiving mirror 30b in 3rd space 12c, reflective condensing is carried out by light-receiving mirror 30b, and the reflected light of the light transmission beam reflected with the object is led to a photo detector 24. And based on the flashing caution signal of a light emitting device 15, and the light-receiving signal of a photo detector 24, the distance to an object calculates with a data-processing means (not shown). Furthermore, the direction of an object is detected from the relation between the excitation phase of the pulse motor 19 when a photo detector 24 receives the reflected light from an object, and a criteria location.

[0024] Thus, according to the gestalt 1 of this operation, the source of luminescence which consists of a light emitting device 15, a light transmission lens 16, and a holder 17 is arranged at the end side side of the hollow shaft 31 of a pulse motor 19, and a photo detector 24 is arranged at the other end side side of a hollow shaft 31, and light transmission mirror 30a and light-receiving mirror 30b are arranged at the other end side side of a hollow shaft 31. Then, that what is necessary is to jump out of the car front face 25, and to carry only the other end side side of a hollow shaft 31 in a car, the optical radar equipment for cars can make small the amount of elutriation from the car front face 25, and can cancel the constraint on the design at the time of mount. Moreover, since it is fabricating to one by using light transmission mirror 30a and light-receiving mirror 30b as the mirror assembly 30, the scan field of a light transmission beam and the light-receiving field of the reflected light from an object can be made to be able to approach in the direction of an axial center of a hollow shaft 31 of elutriation, i.e., the direction from the car front face 25, and the amount of elutriation of the equipment from minute wheel both the front face 25 can be made small. Moreover, the relative position of light transmission mirror 30a and light-receiving mirror 30b can secure with high precision, and the direction of light transmission of a light transmission beam and the light-receiving direction of the reflected light are in agreement with high precision, and can perform range measurement with a sufficient precision. Moreover, it comes to be able to carry out the rotation drive of light transmission mirror 30a and the light-receiving mirror 30b synchronously only by fixing the mirror assembly 30 at the tip of a hollow shaft 31, and assembly nature can be raised.

[0025] Moreover, since he is trying to lead the light transmission beam by which outgoing radiation was carried out from the light emitting device 15 through centrum 31a of a hollow shaft 31 to light transmission mirror 30a, it is not necessary to use optical system special to the transfer system of the light transmission beam from a light emitting device 15 to light transmission mirror 30a, simplification of a configuration is attained, and improvement and low-cost-izing of assembly nature are attained. Moreover, since fitting of fitting section 34a prepared in the covering 34 which supports a hollow shaft 31, and the fitting section 17a prepared in the holder 17 is carried out and the axial center of a hollow shaft 31 and the optical axis of a light emitting device 15 which are the revolving-shaft alignment of light transmission mirror 30a of the mirror assembly 30 are made in agreement, it can scan to a rotation circumferential direction, without displacing a light transmission beam in the direction of an axial center of a hollow shaft 31. Moreover, it is arranged so that a shield 38 may divide in a case 12 at 2nd space 12b and 3rd space 12c, and drum section 30c of the mirror assembly 30 fits loosely into through tube 38a of a shield 38, and 30d of flanges overlaps a shield 38 mutually in the direction of an axial center of a hollow shaft 31 (the thickness direction of a shield 38). Then, it is prevented that the light transmission beam reflected or scattered about within 2nd space 12b carries out incidence to the 3rd space 12c side by the shield 38 and 30d of flanges, and it is prevented that light is received by the photo detector 24. Consequently, the fall of a S/N ratio is suppressed and sufficient range measurement engine performance is obtained.

[0026] Gestalt 2. drawing 2 of operation is the sectional view showing the optical radar equipment for cars concerning the gestalt 2 of implementation of this invention. In the mirror assembly 30 in the gestalt 2 of this operation, fitting hole 30e by which fitting is carried out is prepared at the tip of the hollow shaft 31 which projects from housing 33 at light-receiving mirror 30b. Moreover, the base 20 and the shield 38 of each other are arranged in parallel in a case 12, and the inside of a case 12 is divided by 2nd space 12b which holds the 3rd space 12c and light transmission mirror 30a which hold the 1st space 12a which holds a pulse motor 19, and light-receiving mirror 30b. Moreover, the pulse motor 19 was pressed fit in the through tube of the base 20 in housing 33, and it has fixed at the base 20 so that a hollow shaft 31 may project in 3rd space 12c. And fitting hole 30e of the mirror assembly 30 was pressed fit at the tip of the hollow shaft 31 which projects in 3rd space 12c, and the mirror assembly 30 was positioned by the hollow

shaft 31, and has fixed to it. This mirror assembly 30 is arranged so that drum section 30c may fit loosely into through tube 38a of a shield 38, and light transmission mirror 30a may be located in 2nd space 12b and light-receiving mirror 30b may be located in 3rd space 12c. And 30d of flanges overlaps the shield 38 mutually in the direction of an axial center of a hollow shaft 31 in the periphery section of drum section 30c.

[0027] On the substrate 13 attached in covering 11, a photo detector 24 approaches the axis end of a hollow shaft 31, and is mounted in the axial center location of a hollow shaft 31. Moreover, in 2nd space 12b divided with the shield 38, the light emitting device 15 is mounted on the substrate 14 so that an optical axis may be in agreement with the axial center of a hollow shaft 31. Furthermore, the light transmission lens 16 is attached in the holder 17 so that the optical axis of a light emitting device 15 may pass along the core of the light transmission lens 16. Moreover, it fills up with the transparent material 40 which consists of light transmission material, such as polycarbonate resin and glass, in centrum 31a of a hollow shaft 31.

[0028] Below, actuation of the gestalt 2 of this operation is explained. While the radar installation for cars is operating, a pulse motor 19 drives and a hollow shaft 31 rotates. And the mirror assembly 30 which has fixed to the hollow shaft 31 rotates. That is, light transmission mirror 30a and light-receiving mirror 30b synchronize, and the axial center of a hollow shaft 31 is rotated as the center of rotation. The light transmission beam by which outgoing radiation was carried out from the light emitting device 15 is adjusted to a predetermined angle of divergence by the light transmission lens 16, and is led to light transmission mirror 30a. And it is reflected by light transmission mirror 30a, and the light transmission beam led to light transmission mirror 30a is irradiated out of a case 12 through 2nd space 12b. If the light transmission beam irradiated out of this case 12 is scanned by the rotation circumferential direction of light transmission mirror 30a and has an object, it will be reflected with this object. And a case 12 is penetrated, it results in light-receiving mirror 30b in 3rd space 12c, reflective condensing is carried out by light-receiving mirror 30b, and the reflected light of the light transmission beam reflected with the object passes along the transparent material 40 arranged in centrum 31a of a hollow shaft 31, and is led to a photo detector 24. And based on the flashing caution signal of a light emitting device 15, and the light-receiving signal of a photo detector 24, the distance to an object calculates with a data-processing means (not shown). Furthermore, the direction of an object is detected from the relation between the excitation phase of the pulse motor 19 when a photo detector 24 receives the reflected light from an object, and a criteria location.

[0029] Thus, according to the gestalt 2 of this operation, while the same effectiveness as the gestalt 1 of the above-mentioned implementation is acquired, light is efficiently received by the photo detector 24 through a transparent material 40, and the reflected light from the object reflected by light-receiving mirror 30b can raise the range measurement engine performance.

[0030] Gestalt 3. drawing 3 of operation is the sectional view showing the optical radar equipment for cars concerning the gestalt 3 of implementation of this invention. In drawing, fill up with the transparent material 50 which consists of light transmission material, such as glass, in centrum 31a of a hollow shaft 31, the apical surface of this transparent material 50 is fabricated by convex 50a, and a light emitting device 15 makes an optical axis in agreement with the axial center of a hollow shaft 31, and convex 50a of a transparent material 50 is approached, and it is arranged. In addition, other configurations are constituted like the gestalt 1 of the above-mentioned implementation. With the gestalt 3 of this operation, the light transmission beam by which outgoing radiation was carried out from the light emitting device 15 is adjusted to a passage predetermined angle of divergence in a transparent material 50, and is led to light transmission mirror 30a. Therefore, according to the gestalt 3 of this operation, the same effectiveness as the gestalt 1 of the above-mentioned implementation is acquired. Furthermore, since convex 50a is fabricated to the end face of a transparent material 50 and the lens effectiveness is given to it, the attachment component of the light transmission lens 16 or the light transmission lens 16 becomes unnecessary, the component part mark of the source of luminescence are reduced, and improvement and low-cost-izing of the part assembly nature can be attained.

[0031] Gestalt 4. drawing 4 of operation is the sectional view showing the optical radar equipment for cars concerning the gestalt 4 of implementation of this invention. In drawing, the pulse motor 19 is arranged in 1st space 12a. And fitting section 33a as an engaged portion is prepared in the housing 33 of a pulse motor 19, and fitting of the fitting section 17a of the holder 17 which is a component part is carried out to it in the source of luminescence at this fitting section 33a. Moreover, the cylinder-like hollow shaft 51 is attached in the base 20 and housing 33 free [rotation] through bearing 52. At this time, the source of luminescence and a hollow shaft 51 are positioned through housing 33, and the axial center of a hollow

shaft 51 and the optical axis of a light emitting device 15 are in agreement. Furthermore, fitting was carried out at the tip of the hollow shaft 51 with which fitting hole 30e of the mirror assembly 30 projects from the base 20, and the mirror assembly 30 was positioned by the hollow shaft 51, and has fixed to it. A gear 53 is fabricated by the hollow shaft 51 at one, and it bites to the pinion 55 which this gear 53 has fixed at the tip of the output shaft 54 of a pulse motor 19, and is united with it. Here, the gear 53 and the pinion 55 constitute a power means of communication. In addition, other configurations are constituted like the gestalt 1 of the above-mentioned implementation.

[0032] Below, actuation of the gestalt 4 of this operation is explained. While the radar installation for cars is operating, a pulse motor 19 drives, the running torque of a pulse motor 19 is transmitted to a hollow shaft 51 through an output shaft 54, a pinion 55, and a gear 53, and a hollow shaft 51 rotates. And the mirror assembly 30 which has fixed to the hollow shaft 51 rotates. That is, light transmission mirror 30a and light-receiving mirror 30b synchronize, and the axial center of a hollow shaft 51 is rotated as the center of rotation. Then, the light transmission beam by which outgoing radiation was carried out from the light emitting device 15 is adjusted to a predetermined angle of divergence by the light transmission lens 16, and is led to light transmission mirror 30a through centrum 51a of a hollow shaft 51. And it is reflected by light transmission mirror 30a, and the light transmission beam led to light transmission mirror 30a is irradiated out of a case 12 through 2nd space 12b. If the light transmission beam irradiated out of this case 12 is scanned by the rotation circumferential direction of light transmission mirror 30a and has an object, it will be reflected with this object. And a case 12 is penetrated, it results in light-receiving mirror 30b in 3rd space 12c, reflective condensing is carried out by light-receiving mirror 30b, and the reflected light of the light transmission beam reflected with the object is led to a photo detector 24. And based on the flashing caution signal of a light emitting device 15, and the light-receiving signal of a photo detector 24, the distance to an object calculates with a data-processing means (not shown). Furthermore, the direction of an object is detected from the relation between the excitation phase of the pulse motor 19 when a photo detector 24 receives the reflected light from an object, and a criteria location.

[0033] Thus, since the pulse motor 19 which is a driving source is constituted from the hollow shaft 51 and another object which carry out the rotation drive of the mirror assembly 30 according to the gestalt 4 of this operation, compared with the gestalt 1 of the above-mentioned implementation, the same effectiveness as the gestalt 1 of the above-mentioned implementation is acquired except for the point that the volume of 1st space 12a becomes large.

[0034] In addition, although the hollow shaft 51 and another object which carry out the rotation drive of the mirror assembly 30 shall constitute the pulse motor 19 which is a driving source from the gestalt 4 of the above-mentioned implementation in the optical radar equipment for cars of the gestalt 1 of the above-mentioned implementation, you may apply not only to the gestalt 1 of operation but to the gestalt of other operations. Moreover, with the gestalt of each above-mentioned implementation, although it shall constitute from light transmission material as a case 12, if light cut material is used as a case 12, the disturbance by the light at the time of range measurement can be suppressed, and the accuracy of measurement can be raised. Furthermore, if the laser beam transparency material which makes the light transmission beam by which outgoing radiation is carried out from a light emitting device 15 penetrate alternatively is used, the disturbance at the time of measurement can be suppressed certainly, and the accuracy of measurement can be raised further. Moreover, although reflective coating shall be given to the resin cast fabricated by the desired configuration and the light transmission mirror and the light-receiving mirror shall be constituted from a gestalt of each above-mentioned implementation in one, a monotonous reflecting mirror and a monotonous concave mirror are constructed to the resin cast fabricated by the desired configuration, and a light transmission mirror and a light-receiving mirror may be constituted in one. Or both may be fixed after fabricating a light transmission mirror and a light-receiving mirror with another object.

[0035]

[Effect of the Invention] Since this invention is constituted as mentioned above, it does so effectiveness which is indicated below.

[0036] The source of luminescence which carries out outgoing radiation of the light transmission beam according to this 1st invention, and the photo detector which receives the reflected light of the light transmission beam reflected by the object, The light transmission mirror which reflects a light transmission beam and irradiates an object, and the light-receiving mirror which reflect the reflected light of the light transmission beam from an object, and a photo detector is made to condense, In the optical radar equipment for cars which has the actuator which it synchronizes [actuator] and carries out the rotation drive of a light transmission mirror and the light-receiving mirror, and detects the distance from the light

transmission signal of the source of luminescence, and the light-receiving signal of a photo detector to an object. The source of luminescence is arranged at the end side side of the rotation driving shaft of an actuator, and a photo detector is arranged at the other end side side of the rotation driving shaft of an actuator. And since the light transmission mirror and the light-receiving mirror are arranged at the same end-face side of the rotation driving shaft of an actuator, the amount of elutriation from the car front face at the time of mount can be made small, and the optical radar equipment for cars which can cancel the constraint on a design is obtained.

[0037] Moreover, according to this 2nd invention, in the 1st above-mentioned invention, a light transmission mirror and a light-receiving mirror are arranged at the other end side side of the rotation driving shaft of an actuator. And since it was made to lead the light transmission beam to which the rotation driving shaft of an actuator consisted of cylinder-like hollow shafts, and outgoing radiation was carried out from the source of luminescence to a light transmission mirror through the centrum of a hollow shaft, the configuration of optical system is simplified and improvement and low-cost-izing of assembly nature are attained.

[0038] Moreover, since a transparent material is arranged in the centrum of a hollow shaft, and that end face is formed in a convex, the light transmission beam by which outgoing radiation was carried out from the source of luminescence is adjusted to a predetermined angle of divergence through a transparent material in the 2nd above-mentioned invention and it was made to lead to a light transmission mirror according to this 3rd invention, the component part mark of the source of luminescence can be reduced, and improvement and low-cost-izing of that part assembly nature are attained.

[0039] Moreover, according to this 4th invention, in the 1st above-mentioned invention, a light transmission mirror and a light-receiving mirror are arranged at the end side side of the rotation driving shaft of an actuator. Since the rotation driving shaft of an actuator consists of cylinder-like hollow shafts, and a transparent material is arranged in the centrum of a hollow shaft and it was made to lead the reflected light of the light transmission beam from an object to a photo detector through a transparent material. Light is efficiently received by the photo detector and the reflected light can raise the range measurement engine performance.

[0040] Moreover, the source of luminescence which carries out outgoing radiation of the light transmission beam according to this 5th invention and the photo detector which receives the reflected light of the light transmission beam reflected by the object, The light transmission mirror which reflects a light transmission beam and irradiates an object, and the light-receiving mirror which reflect the reflected light of the light transmission beam from an object, and a photo detector is made to condense, The hollow shaft of the shape of a cylinder which it synchronizes [shape] and carries out the rotation drive of a light transmission mirror and the light-receiving mirror, In the optical radar equipment for cars which has an actuator and the power means of communication which transmits the running torque of an actuator to a hollow shaft, and detects the distance from the light transmission signal of the source of luminescence, and the light-receiving signal of a photo detector to an object. Since the source of luminescence is arranged at the end side side of a hollow shaft, and a photo detector is arranged at the other end side side of a hollow shaft and the light transmission mirror and the light-receiving mirror are arranged at the same end-face side of a hollow shaft. The amount of elutriation from the car front face at the time of mount can be made small, and the optical radar equipment for cars which can cancel the constraint on a design is obtained.

[0041] Moreover, since it was made to lead the light transmission beam to which the light transmission mirror and the light-receiving mirror have been arranged at the other end side side of a hollow shaft, and outgoing radiation was carried out from the source of luminescence in the 5th above-mentioned invention to a light transmission mirror through the centrum of a hollow shaft according to this 6th invention, the configuration of optical system is simplified and improvement and low-cost-izing of assembly nature are attained.

[0042] Moreover, since a transparent material is arranged in the centrum of a hollow shaft, and that end face is formed in a convex, the light transmission beam by which outgoing radiation was carried out from the source of luminescence is adjusted to a predetermined angle of divergence through a transparent material in the 6th above-mentioned invention and it was made to lead to a light transmission mirror according to this 7th invention, the component part mark of the source of luminescence can be reduced, and improvement and low-cost-izing of that part assembly nature are attained.

[0043] Moreover, since a light transmission mirror and a light-receiving mirror are arranged at the end side side of a hollow shaft, and a transparent material is arranged in the centrum of a hollow shaft in the 5th above-mentioned invention and it was made to lead the reflected light of the light transmission beam from an object to a photo detector through a transparent material according to this 8th invention, light is

efficiently received by the photo detector and the reflected light can raise the range measurement engine performance.

[0044] Moreover, according to this 9th invention, it sets to the 2nd or 6th above-mentioned invention. Since it was made to make in agreement the axial center of the optical axis and hollow shaft of a light transmission beam by which prepare the engagement section in the configuration member of the source of luminescence, and prepare an engaged portion in the attachment component of a hollow shaft, the engagement section is made to engage with an engaged portion, and outgoing radiation is carried out from the source of luminescence. While being able to raise assembly nature, it can scan to a rotation circumferencial direction, without making the variation rate of the light transmission beam carry out in the direction of an axial center of a hollow shaft, it is stabilized, and range measurement can be performed.

[0045] Moreover, since the light transmission mirror and the light-receiving mirror are fabricated by one, while being able to raise assembly nature in invention of the above 1st thru/or the 9th invention either according to this 10th invention, the relative physical relationship of a light transmission mirror and a light-receiving mirror is secured with high precision, and the direction of light transmission of a light transmission beam and the light-receiving direction of the reflected light can be in agreement with high precision, and can perform range measurement with a sufficient precision. Moreover, the light-receiving field of the reflected light can be approached in the scan field of a light transmission beam, and the amount of elutriation from minute wheel both the front face can be made small.

[0046] Moreover, according to this 11th invention, the shield which the pars intermedia of a light transmission mirror and a light-receiving mirror fits in loosely, and is divided to a light transmission mirror and light-receiving mirror side in the 10th invention of the above in this pars intermedia is formed. And since the flange which overlaps this shield in the thickness direction of a shield by the circumference of pars intermedia is prepared in pars intermedia and the leakage of the light from a light transmission mirror side to a light-receiving mirror side was prevented by the shield and the flange, the fall of a S/N ratio is suppressed and the range measurement engine performance can be raised.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing the optical radar equipment for cars concerning the gestalt 1 of implementation of this invention.

[Drawing 2] It is the sectional view showing the optical radar equipment for cars concerning the gestalt 2 of implementation of this invention.

[Drawing 3] It is the sectional view showing the optical radar equipment for cars concerning the gestalt 3 of implementation of this invention.

[Drawing 4] It is the sectional view showing the optical radar equipment for cars concerning the gestalt 4 of implementation of this invention.

[Drawing 5] It is the sectional view showing an example of the conventional optical radar equipment for cars.

[Drawing 6] It is the sectional view showing other examples of the conventional optical radar equipment for cars.

[Description of Notations]

15 Light Emitting Device (Source of Luminescence), 16 Light Transmission Lens (Source of Luminescence), 17 Holder (Source of Luminescence), 17a The fitting section (engagement section), 19 Pulse motor

(actuator), 24 A photo detector, 30 A mirror assembly, 30a Light transmission mirror, 30b A light-receiving mirror, 30c A drum section (pars intermedia), 30d Flange, 31 Hollow shaft (rotation driving shaft), 31a A centrum, 33 Housing (attachment component), 33a The fitting section (engagement section), 34 Covering (attachment component), 34a Fitting section (engaged portion), 38 40 A shield, 38a through tube, 50 Transparent material, 50a A convex, 51 Hollow shaft, 51a A centrum, 53 A gear (power means of communication) and 54 Pinion (power means of communication).

[Translation done.]

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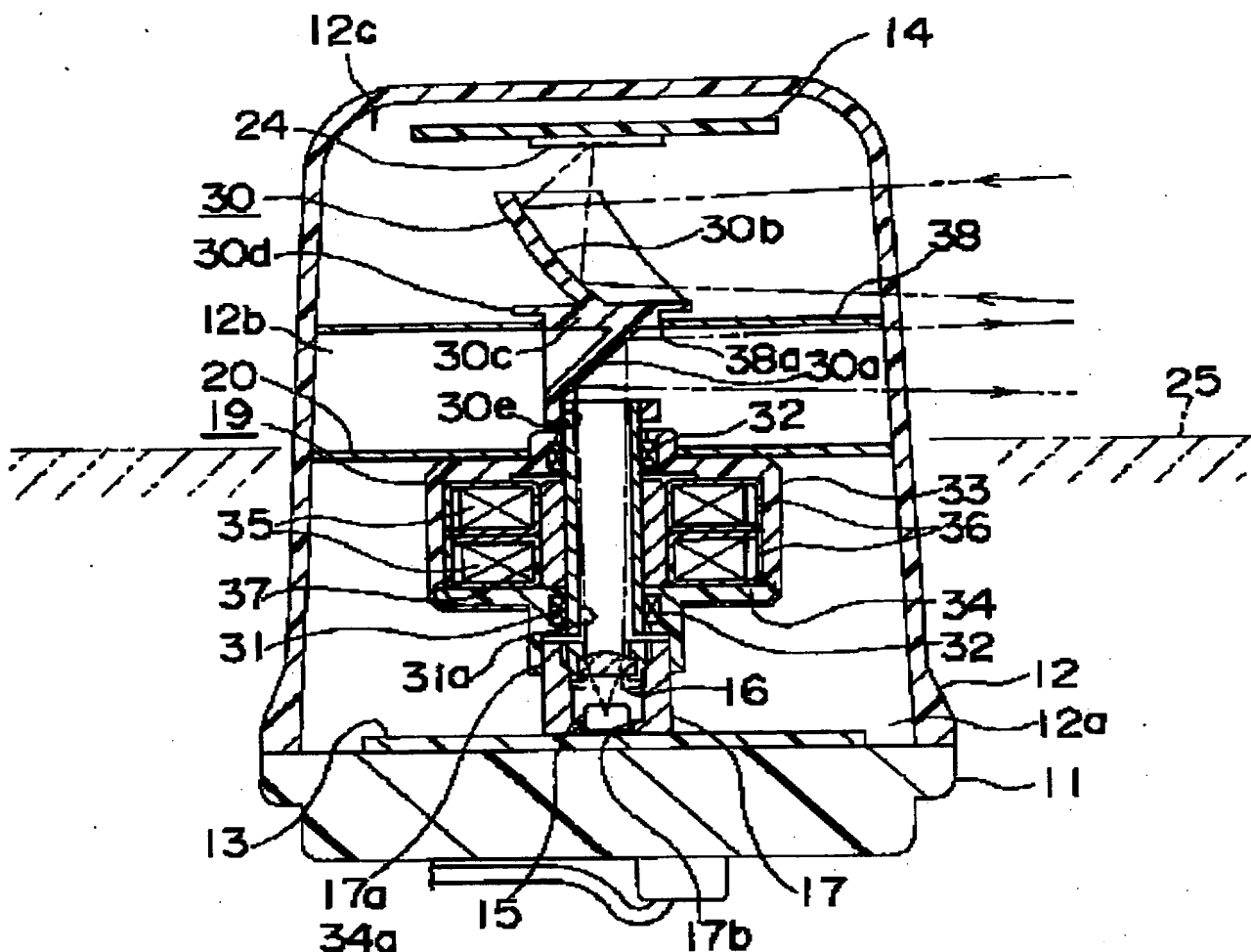
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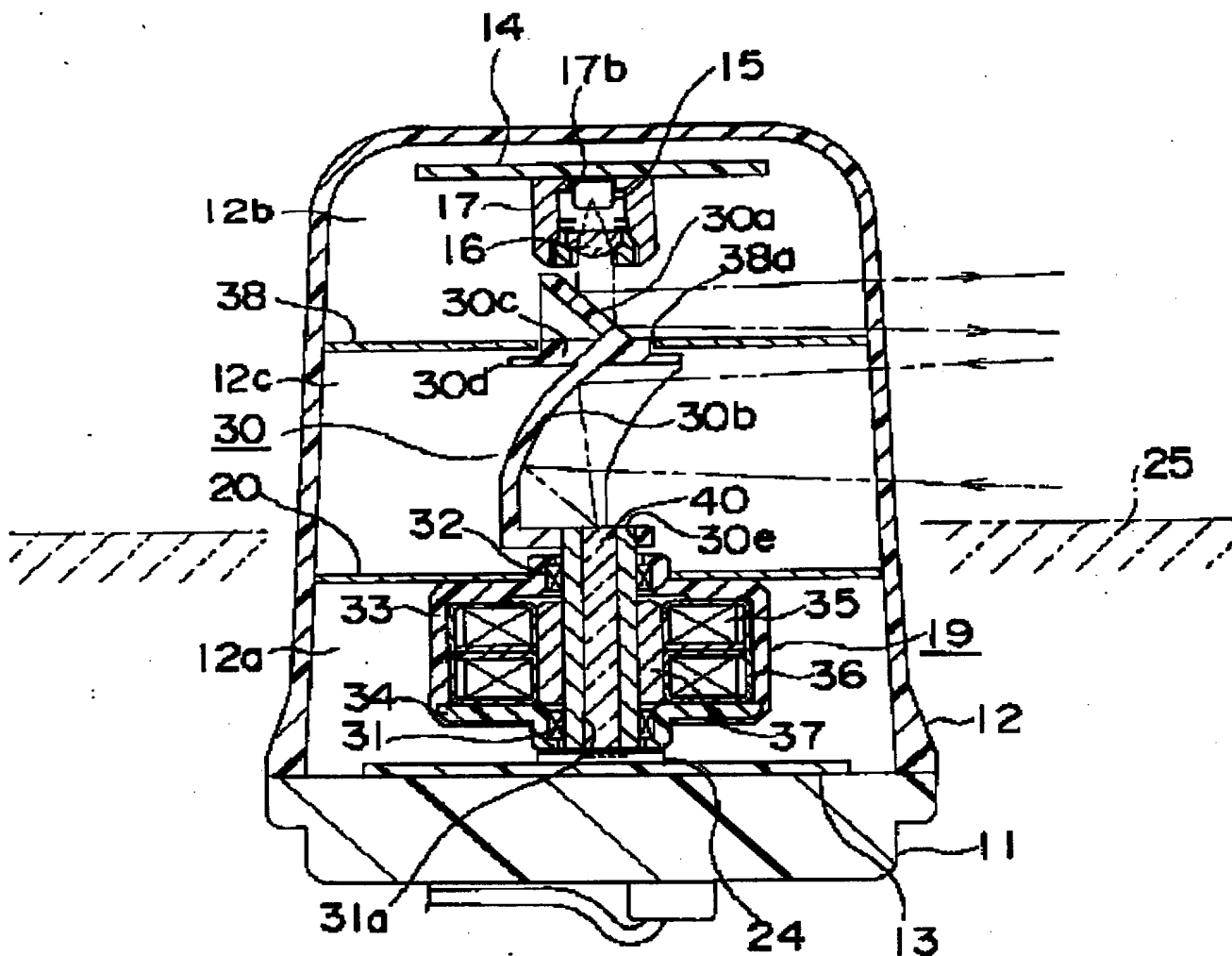
DRAWINGS

[Drawing 1]



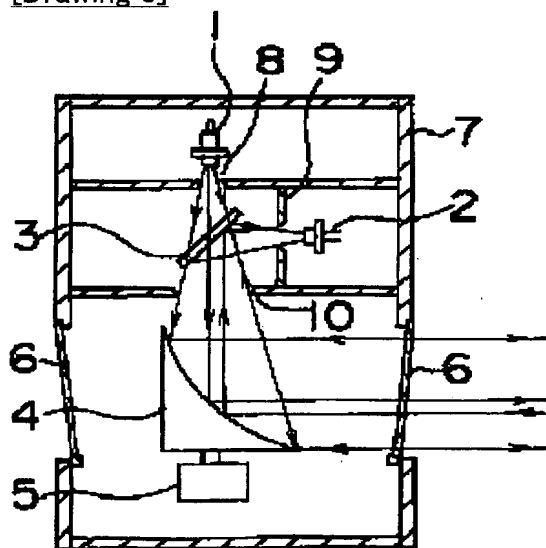
- | | | |
|--------------------|---------------|----------------|
| 15:発光素子(発光源) | 30:ミラー組立体 | 33:ハウジング(保持部材) |
| 16:送光レンズ(発光源) | 30a:送光ミラー | 34:カバー(保持部材) |
| 17:ホルダ(発光源) | 30b:受光ミラー | 34a:嵌合部(被係合部) |
| 17a:嵌合部(係合部) | 30c:胴部(中間部) | 38:遮蔽板 |
| 19:パルスモータ(アクチュエータ) | 30d:金環部 | 38a:貫通孔 |
| 24:受光素子 | 31:中空軸(回転駆動軸) | |
| | 31a:中空部 | |

[Drawing 2]

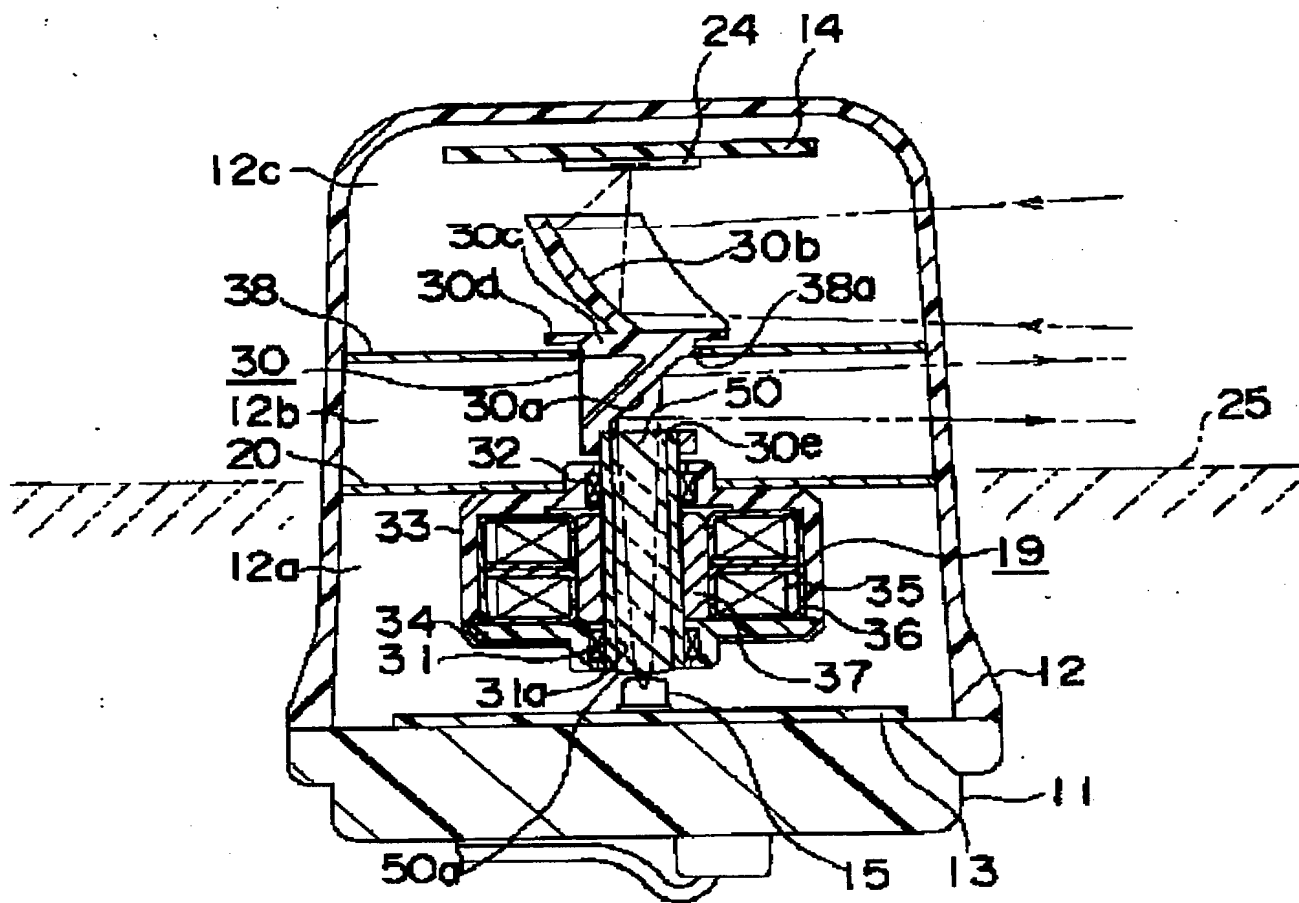


40:導光体

[Drawing 5]

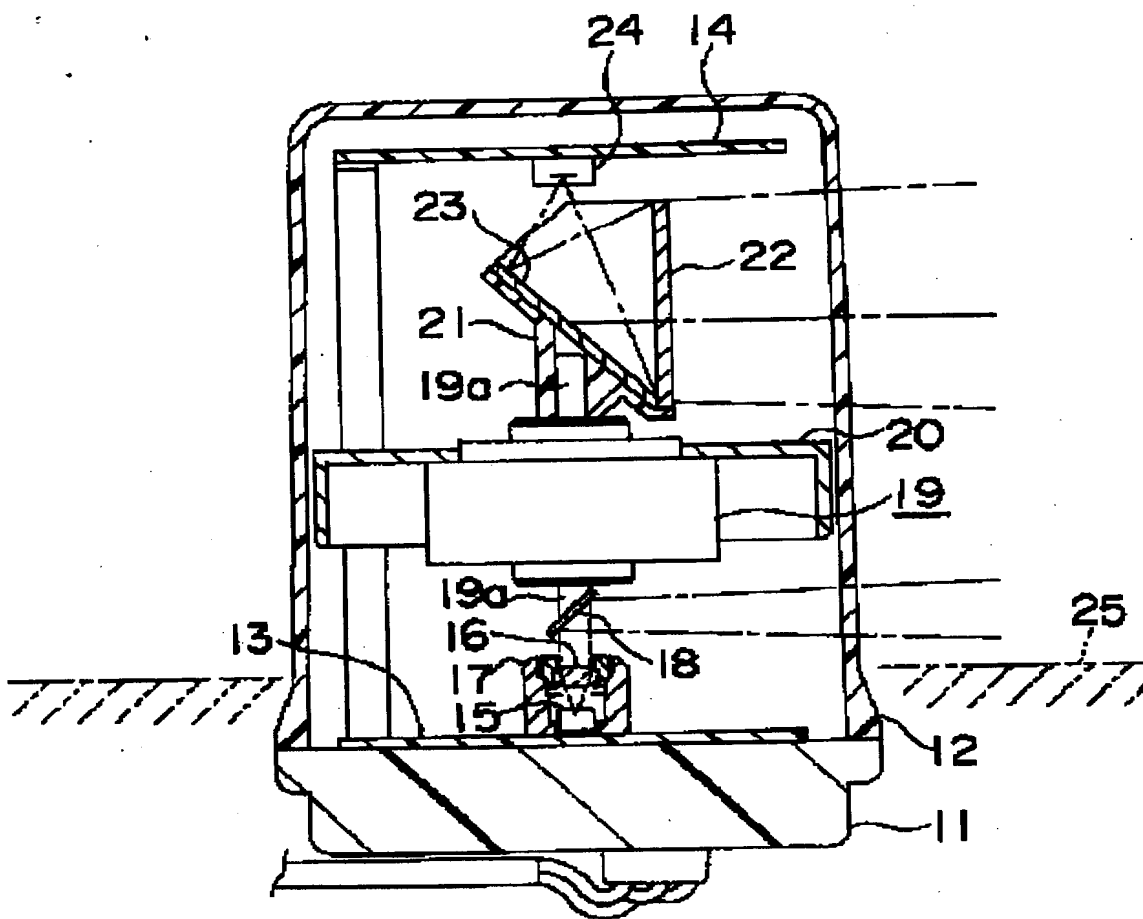


[Drawing 3]



50:導光体
50a:凸面

[Drawing 4]



[Translation done.]

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